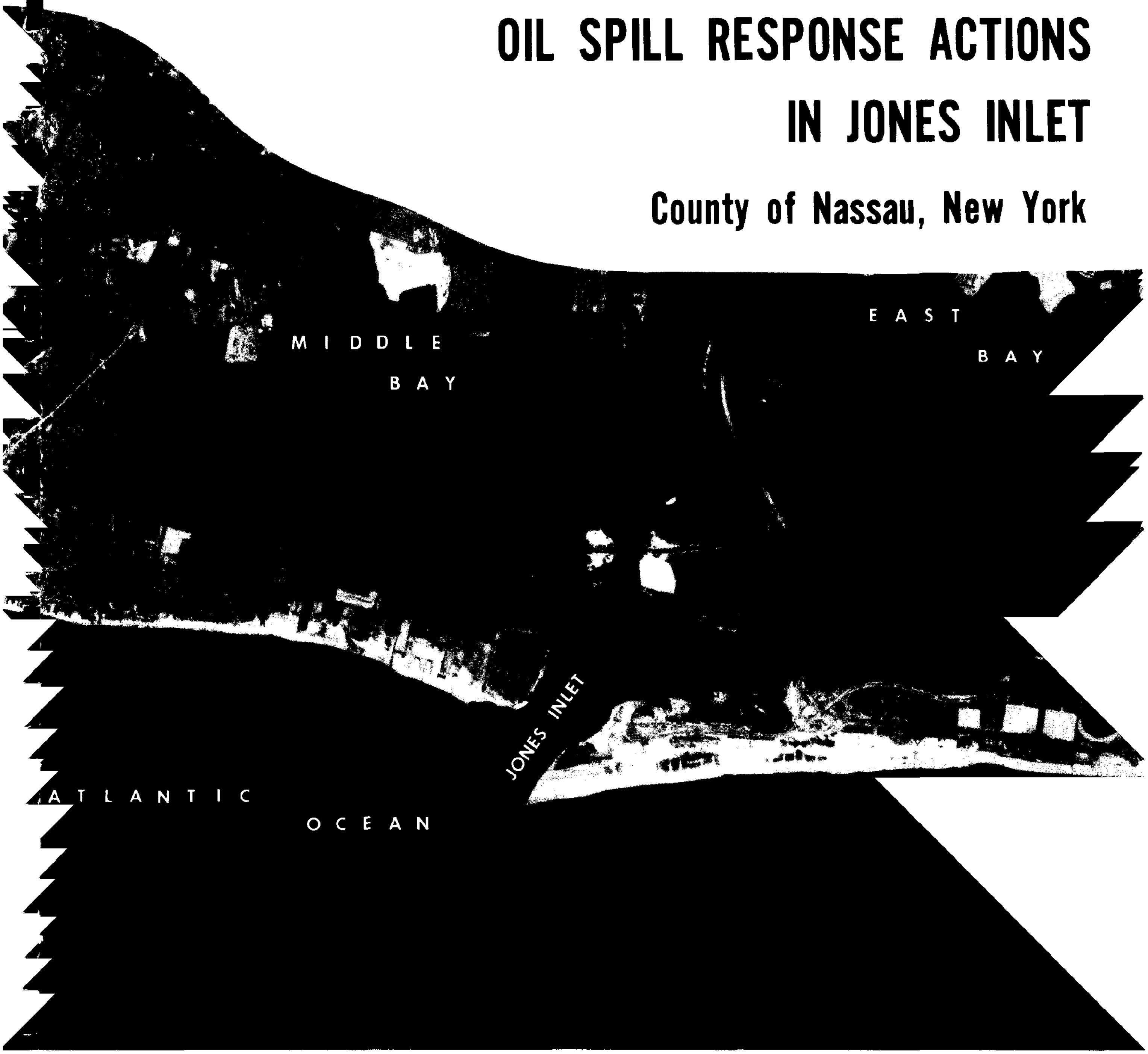
OIL SPILL RESPONSE ACTIONS IN JONES INLET

County of Nassau, New York

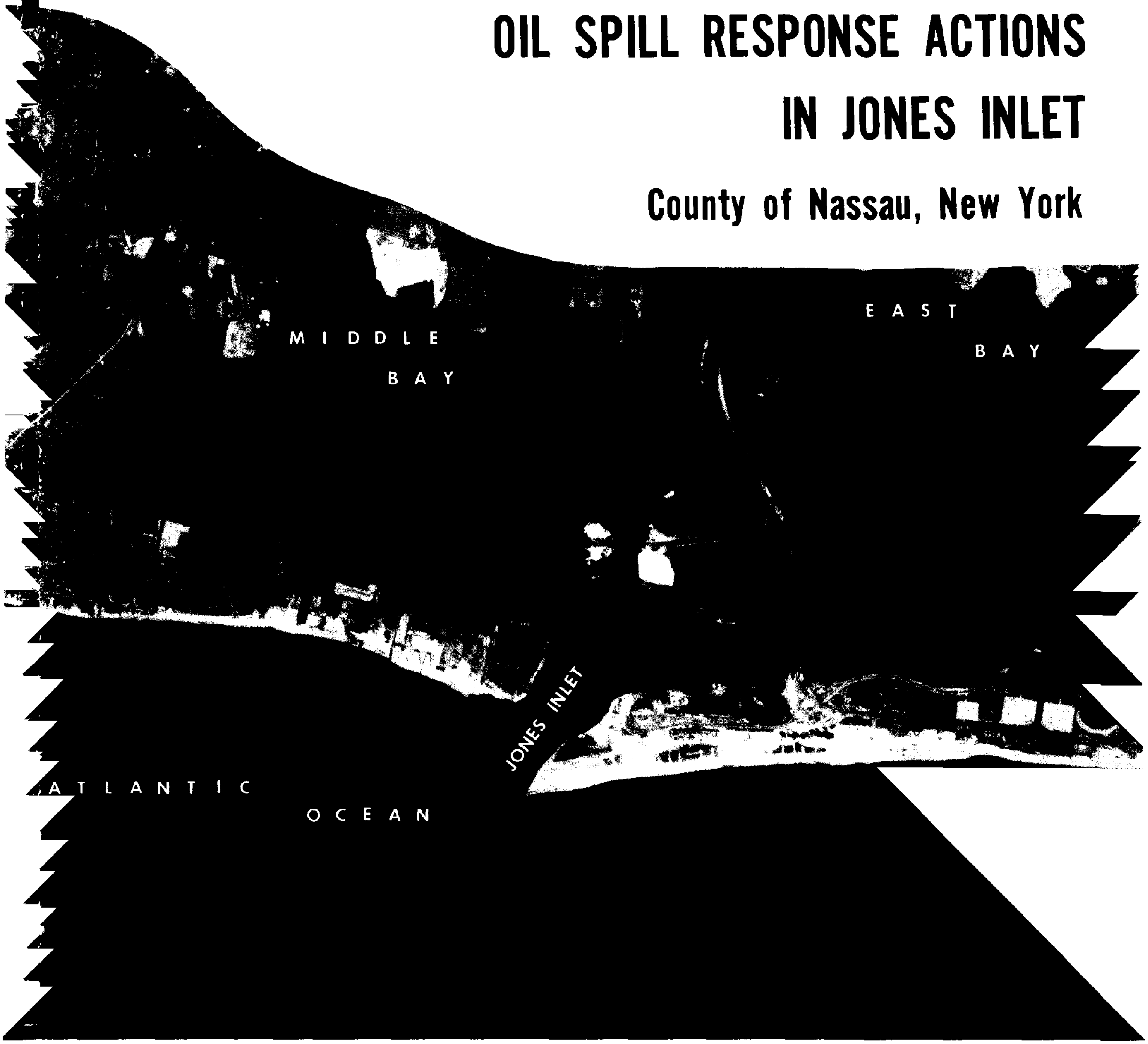


Long Island Regional Planning Board
H. Lee Dennison Office Building
Veterans Memorial Highway
Hauppauge, N.Y. 11788

Dr. Lee E. Koppelman
Project Director

OIL SPILL RESPONSE ACTIONS IN JONES INLET

County of Nassau, New York



Long Island Regional Planning Board
H. Lee Dennison Office Building
Veterans Memorial Highway
Hauppauge, N.Y. 11788

Dr. Lee E. Koppelman
Project Director

OIL SPILL RESPONSE ACTIONS IN JONES INLET
COUNTY OF NASSAU, NEW YORK

Prepared by

Long Island Regional Planning Board
H. Lee Dennison Office Building
Veterans Memorial Highway
Hauppauge, New York 11788

31 October 1981

CEIP Agreement D164093
Task 7.3
CEIP Grant-In-Aid Award No. NA-79-AA-D-CZ054

The preparation of this report was financially-aided through a Federal grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972, as amended. This report was prepared for the New York State Department of State.

OIL SPILL RESPONSE ACTIONS IN JONES INLET
COUNTY OF NASSAU, NEW YORK

Prepared By

Long Island Regional Planning Board
H. Lee Dennison Office Building
Veterans Memorial Highway
Hauppauge, New York 11788

Dr. Lee E. Koppelman
Project Director

\- Staff -

Planning

DeWitt Davies
Edward Mc Tiernan
Mark Riegner
Ronald Verbarg
Michael Volpe
Clarke Williams, Ph.D.

Cartography

Anthony Tucci

Support Staff

Lucille Gardella
Edith Sherman
Gail Calfa

Consultants

Woodward-Clyde Consultants, San Francisco, CA
Carl Foget
Michael A. Acton

Tetra Tech, Inc., Pasadena, CA
James Pagenkopf
Henry L.M. Fong

Acknowledgements

The staff of the Long Island Regional Planning Board was greatly assisted in the preparation of this report by Mr. Harold Udell, Commissioner, Town of Hempstead, Department of Conservation and Waterways, and Mr. Tom Doheny, Director of the Department's Conservation Division. The Department provided the results of tidal current studies and also made the arrangements for a field survey of Jones Inlet and the adjoining bay environments.

Special thanks are due Mr. Joseph Shapiro of Commander Oil Corporation, Oyster Bay, New York, and his associate, Mr. Edgar J. Barnett, Jr., for their efforts in organizing a Long Island Oil Terminal Association (LIOTA) oil spill cooperative. The members of LIOTA have responded by providing listings of oil spill equipment and contacts.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION I INTRODUCTION

1.1 STUDY OVERVIEW

The Long Island Regional Planning Board (LIRPB) with funds provided by the N.Y.S. Department of State under the Coastal Energy Impact Program, and with the assistance of the Regional Marine Resources Council and State and local governmental entities, initiated a three phase program in 1978 to develop options for the protection of all Long Island south shore bay environments from oil spills originating either from Atlantic Outer Continental Shelf (OCS) oil production activities or the tanker transport of petroleum products in the New York Bight. There are five shallow tidal inlets along the Island's south shore that link the bay environments with the Atlantic Ocean: Shinnecock, Moriches, Fire Island, Jones and East Rockaway Inlets. Under Phase I, the LIRPB prepared a report that contained recommended response actions for the containment and cleanup of oil spills impacting the Fire Island Inlet region (Long Island Regional Planning Board, 1979). The subject report, Oil Spill Response Actions in Jones Inlet, has been prepared under Phase II; this phase also includes the preparation of a companion report for the Shinnecock Inlet region. Completion of Phase III is expected by the end of 1981; spill control plans for both Moriches and East Rockaway Inlets will be prepared under this phase. All of the response plans prepared under this effort provide detailed site specific information for use by the U.S. Government On-Scene Coordinator in responding to significant oil spill events.

The program addresses the need as identified in the N.Y.S. Department of Environmental Conservation report, New York State and Outer Continental Shelf Development - An Assessment of Impacts, for the development of adequate oil spill cleanup capability. Oil spills - either from OCS activities or the tanker transport of petroleum - will continue to occur in the future in or near New York's coastal zone.* Coastal areas are fortunate if oil spill trajectories are offshore. However, onshore trajectories from spills originating offshore, and nearshore spills, regardless of their trajectories, pose crises requiring a rapid response if meaningful attempts are to be made to safeguard valuable marine resources found in shallow bays.** Experience has shown that should a major oil spill off the south coast of Long Island occur tomorrow, it would be impossible to clean up the largest portion of the spill. This oil would threaten the south shore beaches and bays. While little could be done to prevent the fouling of the beaches, certain response actions, as identified in this report, can be implemented to contain/collect oil near the ocean inlets before it fouls widespread portions of the productive habitats found in the barrier beach lagoons.

Oil spill contingency plans usually take the form of chain-of-command lists that identify responsibility for spill cleanup, and contain the addresses of potential contractors who have spill cleanup equipment. The state-of-the-art of such plans has been improved through the development of detailed, feasible oil spill cleanup strategies for the Jones Inlet region. The strategies contain information on how and where available oil spill containment/

---

*The worst oil spill in Long Island waters since authorities began keeping records of such incidents in 1972 occurred on 11 January 1978 when the tank barge Bouchard 100 spilled 210,000 gallons of heating oil into Long Island Sound waters near Eatons Neck.

**On 23 February 1981, the Coast Guard informed the LIRPB that a barge containing 2.7 million gallons of #6 oil was adrift in heavy seas eight miles south of Shinnecock Inlet. The barge broke from tow and there were no people aboard the vessel. The wind direction in the afternoon was from the southeast, and it was expected to shift to the southwest during the course of a storm predicted for the evening of 23 February. Coast Guard vessels were on the scene, and an attempt was being scheduled to reconnect the tow rope apparatus. Fortunately, the barge was reconnected during the early morning hours of 24 February and there was no spillage of oil. There are probably many events of this nature occurring that do not result in actual spills. However, the events continue to pose the potential of major oil spills along the south shore of Long Island that could seriously impact not only the ocean shoreline, but bay shorelines as well.

cleanup equipment can be most effectively deployed in an initial response effort.

The potential oil spill problem and its relationship to the south shore bays has been documented in N.Y.S. Department of Environmental Conservation (1977), Long Island Regional Planning Board (1979), Hardy, Baylor, Moskowitz and Robbins (1975), and Stewart and Devanney (1974). These reports contain information on the susceptibility of Long Island's south shore to oil spills, as well as the environmental and economic consequences associated with such spills. Suffice it to say that an oil spill entering the south shore bays could have a devastating effect on estuarine habitats that support extensive commercial and recreational fisheries and waterfowl populations. These bays are also used extensively for recreational boating and water-related recreational activities.

1.2 TECHNICAL CONSULTANTS

The conduct of this study required the services of consultants having expertise in:

1. oil spill containment and cleanup technology, and;
2. hydrodynamic modeling.

Woodward-Clyde Consultants of San Francisco, CA and Tetra Tech, Inc., of Pasadena, CA were retained by the LIRPB for these services. The process employed by the LIRPB in selecting consultants is reviewed in Long Island Regional Planning Board (1979) and other documentation prepared under Contract D142688 for the Fire Island Inlet spill response study.

1.3 REVIEW COMMENTS

Review comments on all phases of the work performed in the development of this spill control plan for Jones Inlet were solicited by the staff. Meetings with local government personnel and the Regional Marine Resources Council were utilized to monitor consultant performance and discuss the technical aspects of oil spill control. A draft of the response plan was distributed to members of the Council and selected Federal, State and local agency officials with responsibilities involving oil spill control and/or environmental protection, and a request for comments was made. Appendix A contains a digest of the formal comments submitted by those responding to this request, as well as responses by the staff and its consultants to the issues/points raised. This digest is an integral part of this report, as it contains information pertaining to the implementation of recommended strategies detailed in Section 5.

1.4 BACKGROUND INFORMATION

Part of this study was devoted to the preparation of inventory information on subjects germane to the cleanup and disposal of oily waste. Appendix B contains an inventory of oil spill equipment available in the Long Island region. This appendix is in three parts:

1. equipment owned by spill contractors and spill cooperatives;
2. equipment owned by Federal, State and local agencies; and
3. equipment owned by members of the Long Island Oil Terminal Association (LIOTA) under cooperative clean up agreement.

Appendix C consists of an up-to-date listing of facilities that are capable of processing oily waste, as well as a listing of approved waste oil collectors located in the New York Metropolitan Region. Preparation of this appendix was necessary because of the problems associated with finding a location for the disposal of oil contaminated materials resulting from spill cleanup.

Information on dispersants, their application techniques and environmental effects is contained in Appendix D. Appendix E deals with sorbent barrier construction for use at the entrances to mosquito ditches and other low current areas.

SECTION 2 OIL SPILL SCENARIO

The primary objective of this study is the development of recommended initial response actions to prevent or minimize oil pollution in the Nassau County south shore bay system that might result from oil spills impacting the Jones Inlet region. In order to develop initial response plans it was necessary for the LIRPB staff to define an oil spill scenario that would reflect various factors influencing the selection of response actions. The scenario described below represents a "worst case" situation; it is based on the characteristics of petroleum transport activities in the New York Metropolitan Region.

2.1 OFFSHORE SPILL SCENARIO

The Port of New York and New Jersey is one of the major ports of the world. In 1975 ship arrivals at the Port were estimated at over 10,000 vessels. Seventy one percent of the total waterborne commerce - 127 million short tons - consisted of shipments of petroleum products and crude oil to terminals in the Port of New York and New Jersey for refining. Even if pipelines are used to transport crude oil that may be produced from Atlantic Outer Continental Shelf areas, "there is still a substantial danger of spills from tankers that presently travel nearly parallel to Long Island" in the Nantucket/Ambrose traffic lanes south of Long Island (N.Y.S. Department of Environmental Conservation, 1977, p. 67).

Approximately one-third of the 2,400 trips of all tankers between the 20,000 and 70,000 DWT range entering the Port in a given year travel the Nantucket/Ambrose traffic lanes. Tanker traffic in these lanes could increase up to 19% (150 additional trips), if all the potential oil produced from the Georges Bank were tankered to the Port and foreign oil imports were not displaced. The additional tanker traffic would increase the risk of oil spills. Tankers up to 85,000 DWT utilize the Nantucket/Ambrose lanes to transport oil to the Port of New York and New Jersey. However, vessels of this size and others in excess of 40,000 DWT must lighter their cargo at sea.

The following scenario developed by the staff for the preparation of a spill response plan at Jones Inlet reflects petroleum transport activities in the northern section of the New York Bight.

> *The loss of an 85,000 DWT tanker carrying crude oil south of Long Island at the approximate location, 40°28'N, 73°35'W; during summer weather conditons that are conducive to the northerly transport of spilled oil. Oil from this spill event is assumed to strand along the shore of Lido Beach and the Jones Beach State Park, and also enter Jones Inlet.*

The spill site is located directly south of Jones Inlet in the separation zone between the Nantucket/Ambrose traffic lanes. The oil spill technology consultant was instructed to amplify this scenario through the provision of sufficient detail that would be required in the formulation of spill control strategies.

2.2 LIKELIHOOD OF SPILL EVENT AS DESCRIBED IN THE SCENARIO

The oil spill event described above is based on characteristics of petroleum transport in the New York Bight. While both small and large spills associated with tanker casualties are not uncommon events when viewed on a global scale, it is not possible to make accurate predictions of spill events, and the probabilities associated with them on local time and space scales. In general terms, smaller spills are more probable than larger spills, but again, quantification of the likelihood of such spills was not attempted in this report. Such a computation would also be complicated by adding dimensions of spill location and timing, both of which would act to decrease the likelihood of the scenario event.

What can be said is that the specific spill event as described in the scenario is highly unlikely. For the purposes of oil spill planning, it was necessary to relate response actions to an event whose occurrence is possible in the region, and has the potential of causing major environmental disruption.

SECTION 3 CONCLUSIONS AND RECOMMENDATIONS

This study shows that in the event of an offshore oil spill, conventional booming and skimming techniques would be effective in limiting contamination of the wetlands and bay shorelines within Jones Inlet to a small area. Due to the fast currents coming through the inlet, which can attain speeds of 1.8 knots at maximum flood tide (Norman Porter Associates, 1964), these response actions would be implemented inside Jones Inlet, where the tidal currents are considerably less. The use of booms and skimmers within the inlet would be ineffective because of the fast currents (Vanderkooy) et al., 1976). Since oil must pass through the inlet prior to its containment and cleanup, a minor amount of shoreline would be contaminated.

The amount of oil spill equipment available in the Long Island area would be more than adequate to respond to a spill off Jones Inlet. Effective booms (Optimax), self-propelled skimmers, and other spill equipment could be provided by Clean Harbor Cooperative, Marine Pollution Control, and other spill contractors upon request of the U.S. Government On-Scene Coordinator. Oil spill equipment is also available from members of LIOTA.

There would be sufficient response time (difference between the time of the spill and the time when the slick reaches Jones Inlet) to allow for spill response by local contractors and others. Storage of oil spill response equipment at the Town of Hempstead Marina at Point Lookout would decrease response times.

The ocean beaches of southern Long Island could not be protected from contamination using these same conventional booming and skimming techniques. Dispersants would have to be used to treat the oil slick in the offshore area. Applying dispersants would prevent or reduce beach contamination providing the oil is amenable to dispersant treatment. However, since dispersed oil mixes in the water column, the possibility would still exist for some oil to reach the beaches or to be carried through the inlet by subsurface currents. These subsurface currents are relatively uninfluenced by winds and are therefore slower than wind-aided surface currents. These subsurface currents tend to move along shore in a westerly direction. An immediate decision to use dispersants would have to be made because from 24 to 36 hours are necessary to implement a dispersant spraying system. Steps should be taken to assemble dispersant application equipment and personnel immediately in the event of a major spill. The decisionmaking process leading to use of this alternative should also be initiated immediately.

A berm constructed at the mid-tide line on Jones, Lido, and the other barrier island beaches would limit contamination and make cleanup easier.

It would be advisable to construct permanent anchor points at the shoreline boom termination points shown in Figure 6. These would provide stable anchoring points for booms with high tensile forces placed on them (i.e., diversion booms). Deployment times would be reduced when booms could be rapidly connected to shoreline.

SECTION 4 HYDROGRAPHIC CONDITIONS AT JONES INLET

In order to conduct an assessment of the environmental factors which would effect oil spill response actions, it was necessary to review and analyze the available hydrographic data for Jones Inlet. An existing link-node tidal current model of the Nassau County south shore bay system was used to supplement actual measurements of current velocity (Tetra Tech Inc., 1980a).

4.1 HYDROGRAPHIC SETTING

Jones Inlet connects the Atlantic Ocean with the Nassau County south shore bay system, a series of interconnecting estuaries on the south shore of Long Island (Figure 1 provides a location map for the study area). East Rockaway Inlet towards the west interacts with Jones Inlet in this region. Reynolds Channel is on the shore side of the barrier beach and is the main passageway for water transport between East Rockaway and Jones Inlets. Similarly, Sloop Channel is the main connection between Jones Inlet and South Oyster Bay, Western Great South Bay, and Fire Island Inlet towards the east.

Approximately 1,500 million cubic feet of water pass in and out of Jones Inlet on an average tide. Water transport and exchange through Jones Inlet primarily affects Middle, East and South Oyster Bays (located from west to east, respectively). Middle Bay extends from Island Park on the west to Petit Marsh on the east. Several channels link the shallow, open sections of the bay with Reynolds Channel to the south. Long Creek and Swift Creek are the deepest channels, dredged to about 20 ft. The northern part of East Bay is open and is less than 2 ft. deep. The southern part of this bay is similar to Middle Bay with tidal flats, islands, and dredged channels. Haunts Creek is the major channel and is about 10ft. deep.

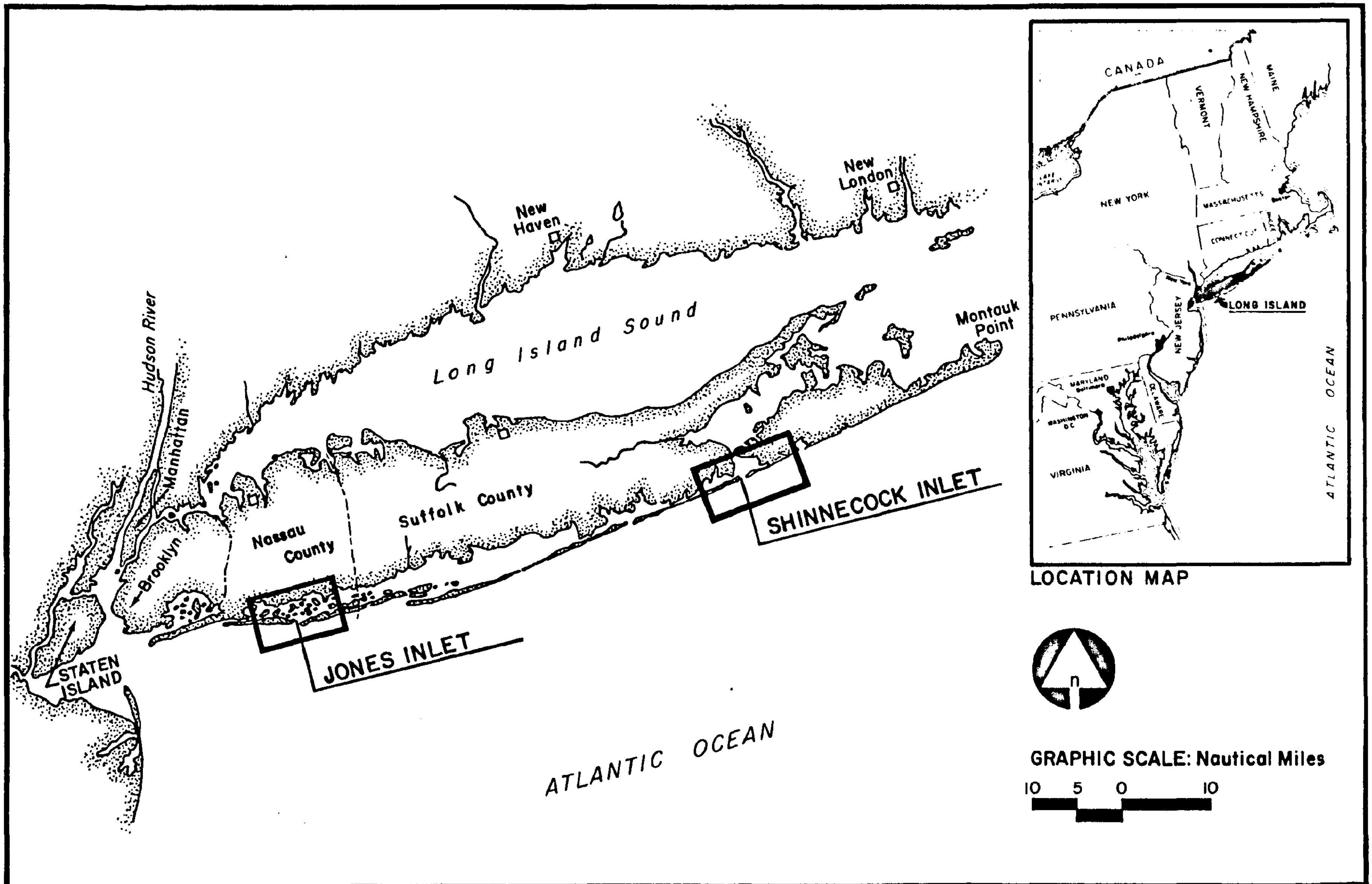


FIGURE 1 LOCATION OF JONES AND SHINNECOCK INLET STUDY AREAS

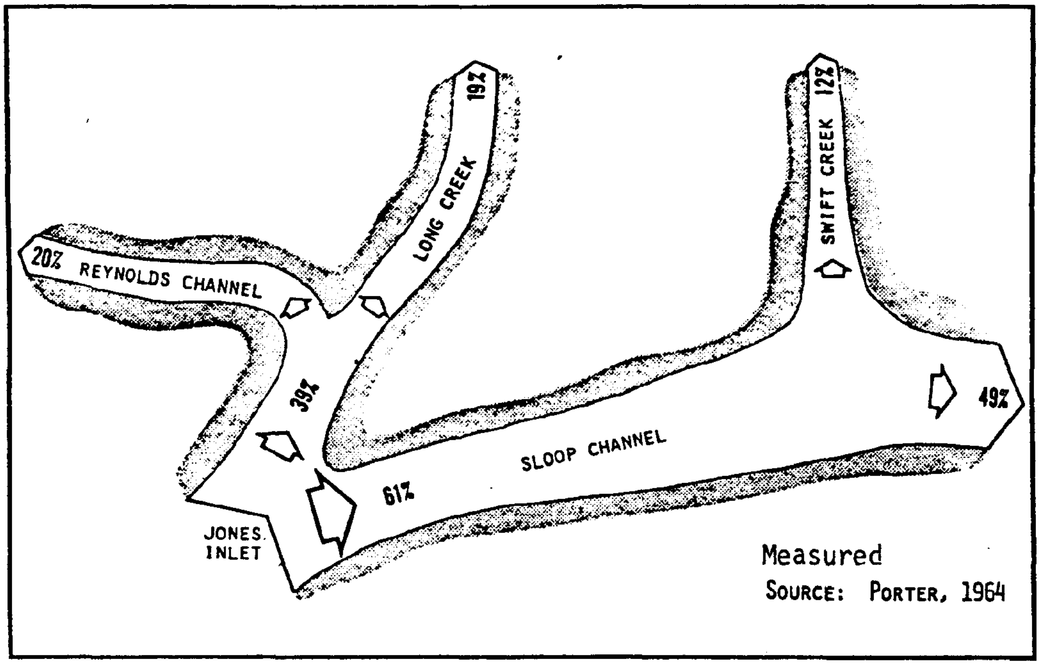
South Oyster Bay extends from Great Channel on the west, eastward to a narrow passageway to Great South Bay south of Carman and Narraskatuck Creeks. The State Boat Channel along Jones Beach is approximately 20 ft. deep and brings water from Jones Inlet into Great South Bay. Amity Channel runs through the lower part of the bay and is about 10 ft. deep. The rest of the bay is open and between one and three ft. deep.

Tidal flow and distribution in the Nassau County south shore bay system is complicated by the great number of channels and marsh islands. About 61% of the average tidal flow entering Jones Inlet travels easterly through Sloop Channel. The remaining 39% of the tidal flow travels westerly and is rather evenly distributed between Long and Reynolds Channels. (See Figure 2.)

4.2 HYDROGRAPHIC CHARACTERISTICS OF JONES INLET

Available information regarding littoral forces that would affect oil spill response actions in Jones Inlet is reviewed in Tetra Tech, Inc. (1980b). From this review it was determined that tides within the study area are semi-diurnal, with a period of 12.42 hours; the mean tidal range in the Atlantic Ocean south of Jones Inlet is about 4.2 ft. with a spring tide range of 5.0 ft.; and the mean tidal range inside the bay varies from 4.0 ft. at Jones Inlet to about 2.0 ft. at the Nassau-Suffolk border in South Oyster Bay.

Along the south shore of Long Island, the prevailing winds are from the southwest. On a seasonal basis, the prevailing winds are from the southwest from April through October, from the west in November and December, and from the northwest in January, February and March. At Sea, the winds from the westerly quadrants prevail. Velocities approaching 100 miles per hour have been reported along the south shore during storms. The Jones Inlet area is also subject to hurricanes and extratropical cyclones, which are also known as northeasters.



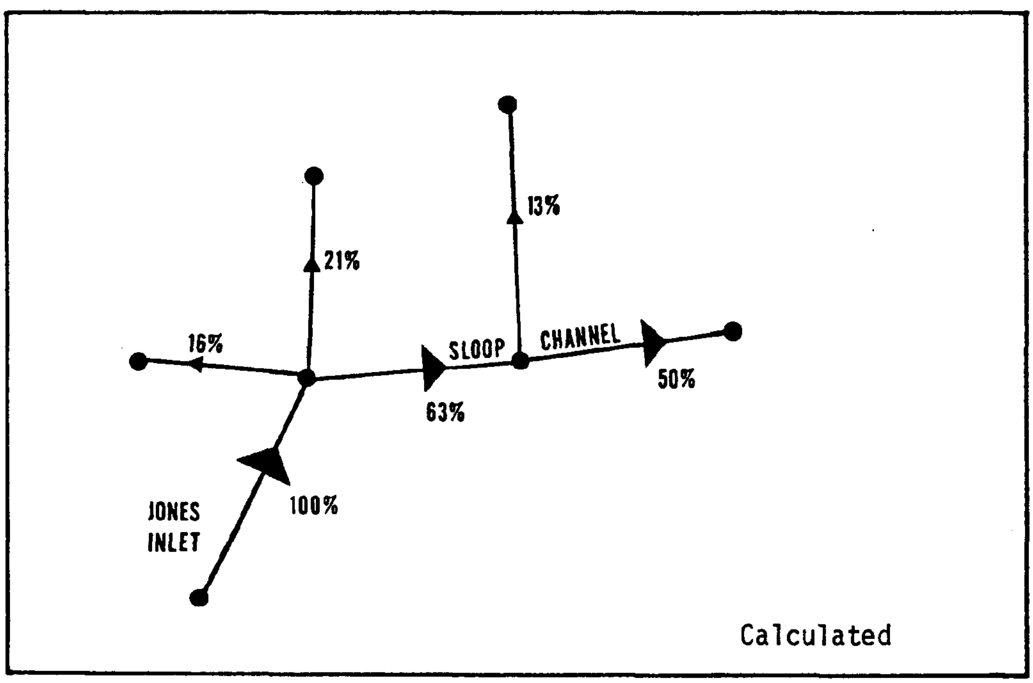


FIGURE 2 COMPARISON OF MODELED AND MEASURED FLOW DISTRIBUTIONS NEAR JONES INLET

The direction and velocity of tidal flow in the Jones Inlet area is highly variable. The results of previous runs of a semi-one-dimensional link-node model of the south shore bay system were used to supplement available information on currents in the channels leading to and through Jones Inlet (Tetra Tech, Inc., 1980a).

In this model, the direction of tidal flows and currents is constrained along the axis of the grid lines or "channels". In addition, the ability of the calculated currents to represent real world currents is determined by the degree of approximation made in specifying the grid geometry. For the Jones Inlet vicinity, the assumption of one-dimensional flow is fairly reasonable due to the highly channelized nature of the bay and inlet system. However, even in these channels velocity variations will occur across the channel, with the maximum velocities occurring at mid-channel and minimum velocities at the channel sides due to boundary layer frictional effects. The modeled currents, on the other hand, represent the gross average channel velocities obtained by dividing the instantaneous channel flows by the corresponding channel cross-sectional areas, which vary over the tidal cycle. Therefore, currents produced in the model indicate the channel velocity integrated over the entire width and depth of the channel. In terms of an oil slick moving in a channel, the model will tend to underpredict the speed of the slick along the channel centerline and overpredict the speed of the slick along the channel banks, such that the average penetration of the slick edge across the channel width is approximated by the model.

Figure 2 compares the results of the modeled system with the measured flows in the various channels behind Jones Inlet.

After model set-up and testing the model was used to calculate mean tidal rangers, co-tidal lines, channel flows and current velocities under spring and neap tide conditions. Model results for spring tide current velocities are summarized in Figure 3. The full results of this analysis can be found in Tetra Tech, Inc., (1980a).

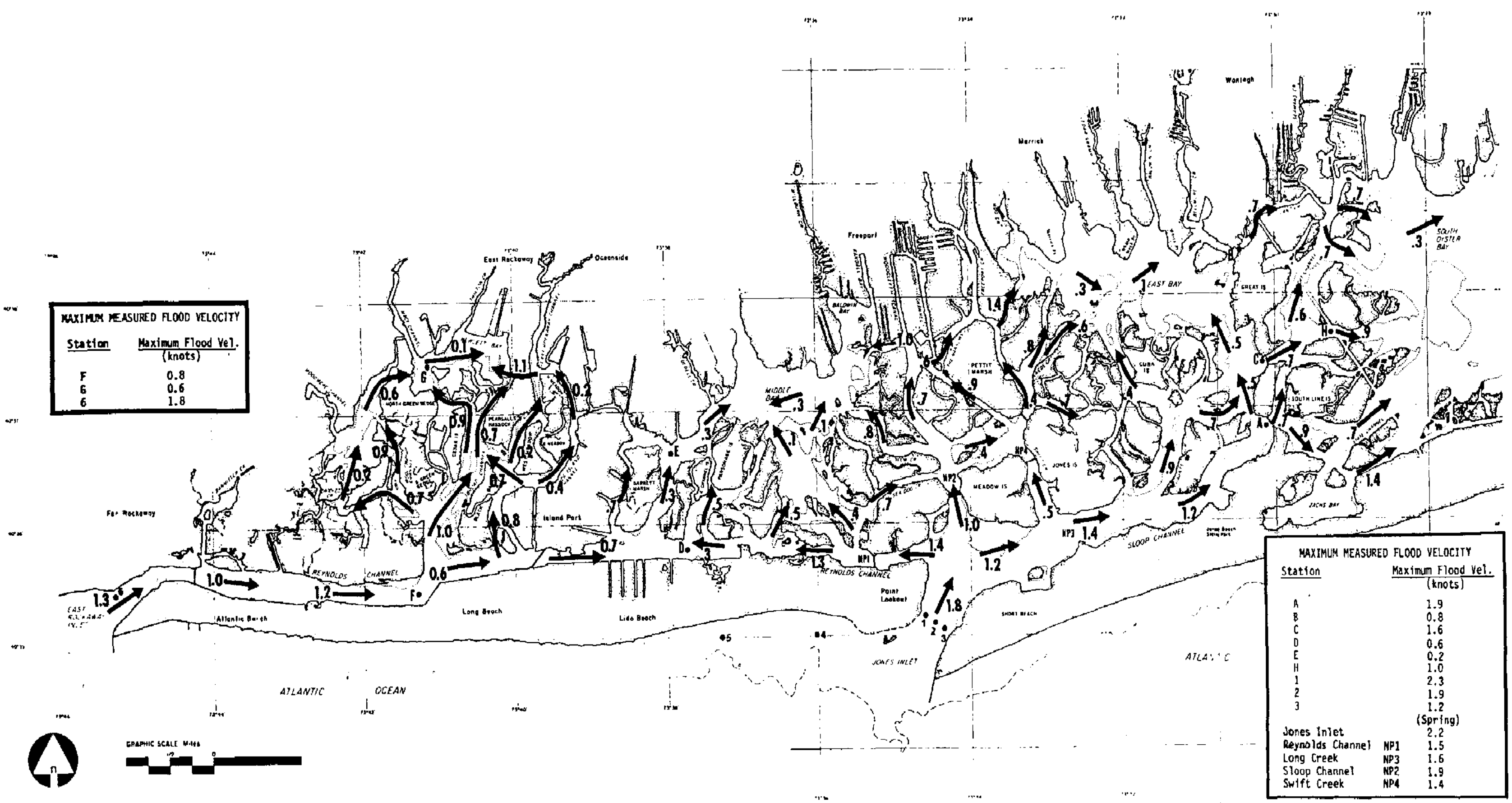


FIGURE 3 - TETRA TECH LINK-NODE MODEL RESULTS
MAXIMUM SPRING TIDE FLOOD CURRENTS
(KNOTS)

SECTION 5 RECOMMENDED OIL SPILL RESPONSE ACTIONS

5.1 INTRODUCTION

The Jones Inlet region of Long Island is comprised of extensive beach and marshland which support ecologically diverse resources of biological, aesthetic, recreational, and economic importance. The marsh areas of Middle, East, and South Oyster Bays support populations of various hawks, herons, and egrets. Hard clams are abundant in these bays, especially adjacent to the marshes. Most of the bays are closed to shellfishing because of water quality problems. However, portions of East Bay, Sloop Channel and Haunts Creek are open to shellfishing year-round.

Large numbers of visitors use Jones, Lido, and the other beaches on the south shore of Long Island during the summer months. More than 100 marinas and extensive residential and commercial areas line the shoreline of the bays inside Jones Inlet.

An oil spill occurring in the coastal waters off Jones Inlet could have adverse effects on all the aforementioned resources. The effects of such a spill could be minimized through the use of efficient spill control and containment actions. The degree to which these spill response actions can be effectively implemented is predicted using a wide variety of incident specific factors such as the amount of time after the spill before shoreline contamination occurs, oil type and quantity, available spill response resources, ocean currents and tides, and prevailing winds and temperature. By examining a hypothetical spill scenario that closely approximates an incident that could occur, the feasibility and effectiveness of response actions can be predicted with sufficient accuracy for planning purposes.

5.2 DETAILS OF OIL SPILL SCENARIO

The scenario put forth in this study represents the most probable major oil spill that would occur at Jones Inlet; a spill 11 miles offshore in the shipping lane resulting from a tanker accident.

The scenario will be evaluated using the following procedure:

1) Slick Modeling. The general trajectory and spread of the spill will be predicted for the scenario conditions. Key factors desired from this effort include first arrival time, rate of subsequent movement, probable extent of water and shoreline contamination and the net movement of the slick within the inlet.

2) Priority Analysis. This analysis considers the resources of the immediate area and their biological, aesthetic, recreational, and economic values. These resources are assigned primary or secondary protection priorities according to both their sensitivities to spilled oil and their value.

3) Local/Regional Response. Local and regional oil spill response resources were inventoried and their probable performance (i.e., response time) evaluated. Response time evaluations are based on an initial reaction and mobilization period, estimated travel time to the response site, and estimated deployment time as a function of equipment type.

4) Equipment Performance. Most spill control equipment only functions effectively within a certain range of environmental conditions. This evaluation will consider limiting characteristics of the inlet and vicinity, limiting scenario criteria, and performance characteristics of locally and regionally available equipment.

5) Scenario Assessment. The preceding factors will be assessed for response feasibility, effectiveness, and generalized impacts.

5.2.1 Scenario Parameters

The scenario presented here involves a crude oil spill resulting from an 85,000 DWT tanker casualty. Collision with another vessel would be the likely cause of the incident, which occurs approximately 11 miles south of Jones Inlet at 73^{o} 34' 46" W; 40^{o} 26' 12" N. Other pertinent spill scenario parameters include the following:

Spill Size. Total loss of two adjacent cargo tanks with an approximate volume of 107,000 barrels (16,000 tons) is assumed to occur within minutes.

Oil Characteristics. Oil density of 0.854 gm/cm^3 (34^{o} API Gravity), pour point of $-15^{o}F$, viscosity of 43 sus @ $100^{o}F$

Season. Summer

Tide. Slick encounters Jones Inlet at maximum flood tide.

Wind. From the south at 10 knots

Waves. Calm conditions, waves less than 1 foot inside Jones Inlet.

Temperature. $80^{o}F$

5.2.2 Spill Movement

Predictions of oil slick movement were extrapolated from current modeling provided by Tetra-Tech Inc., (1980b). Slick spreading and wind deflection were also incorporated. Spreading of the oil slick was calculated using the equations of Premack and Brown (1973).

Following the tanker accident south winds and the general circulatory patterns will drive the slick toward Jones Inlet at approximately 3 percent of the wind speed. Under these conditions the slick will cover the 11 mile distance from the accident site to Jones Inlet in 40 hours. When the slick reaches the shores of Long Island its diameter is approximately 3 nautical miles. A considerable portion of the slick will come ashore on the beaches both to the west and east of the 0.5 mile wide inlet. It is difficult to determine exactly how much of the slick would actually enter Jones Inlet and pass into Middle, East, and South Oyster Bays. However, at maximum flood tide it is believed that a considerable entraining effect would occur near the inlet and perhaps 30 percent of the oil remaining after 40 hours would enter.

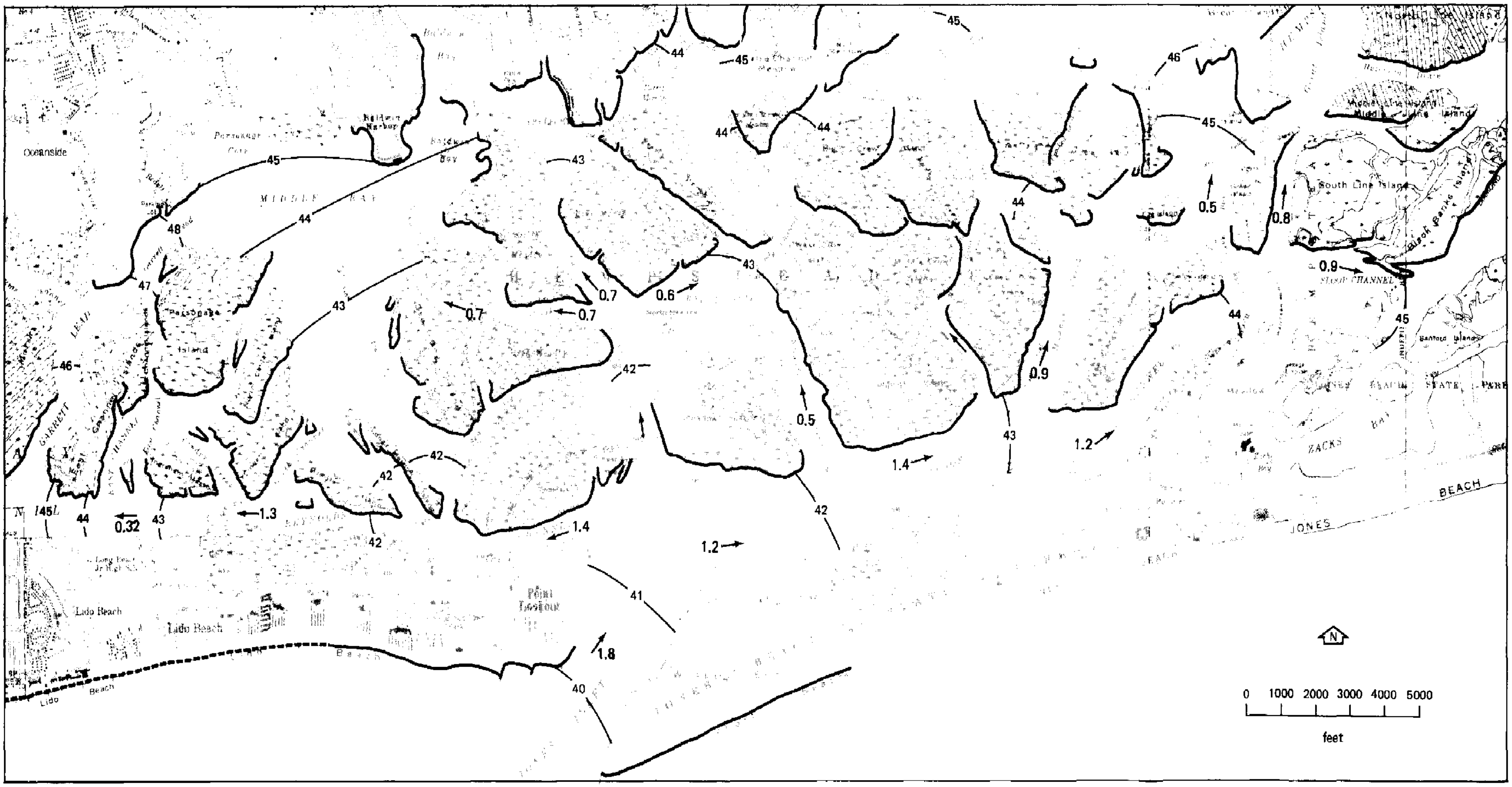
Under the conditions presented in this scenario, including air temperatures of up to $80^{o}F$ and a slick thickness which decreases from

7.00 mm at 1 hour to .32 mm at 40 hours, the light crude oil is subject to considerable evaporative loss. This loss would decrease the slick's volume by approximately 48 percent (Mackay, et al., 1980), from 107,000 to 55,600 barrels, during the initial 40 hours. Approximately 16,700 barrels, or 30 percent of this oil remaining after 40 hours would enter Jones Inlet. It should be noted that the majority of this evaporative loss would consist of the oil's toxic, low molecular weight hydrocarbon components such as benzene and toluene.

Upon entering Jones Inlet the oil slick would be driven by the incoming flood tide and southerly winds up into the wetlands of Middle, East, and South Oyster Bays. The majority of flood tide flow (61 percent) moves up Sloop Channel once inside the inlet (Norman Porter Assoc., 1964). The remainder of the flood tide flow is into Reynolds Channel (20 percent) and Long Creek Channel (19 percent). It can be assumed that an oil slick will move in the same approximate proportions.

Figure 4 shows the extent of shoreline oil contamination which would occur on the initial flood tide without the implementation of the recommended response actions. Approximately 20 miles of marsh shoreline would be impacted. Figure 5 shows initial flood tide shoreline oil contamination with the execution of response actions. In this case marsh contamination is reduced to approximately 3 miles.

The portion of the slick that did not enter Jones Inlet would initially contaminate 1.25 miles of beach on both sides of the inlet. Over time, the slick would move westward due to the longshore current patterns, extending shoreline beach contamination toward East Rockaway Inlet.



LEGEND

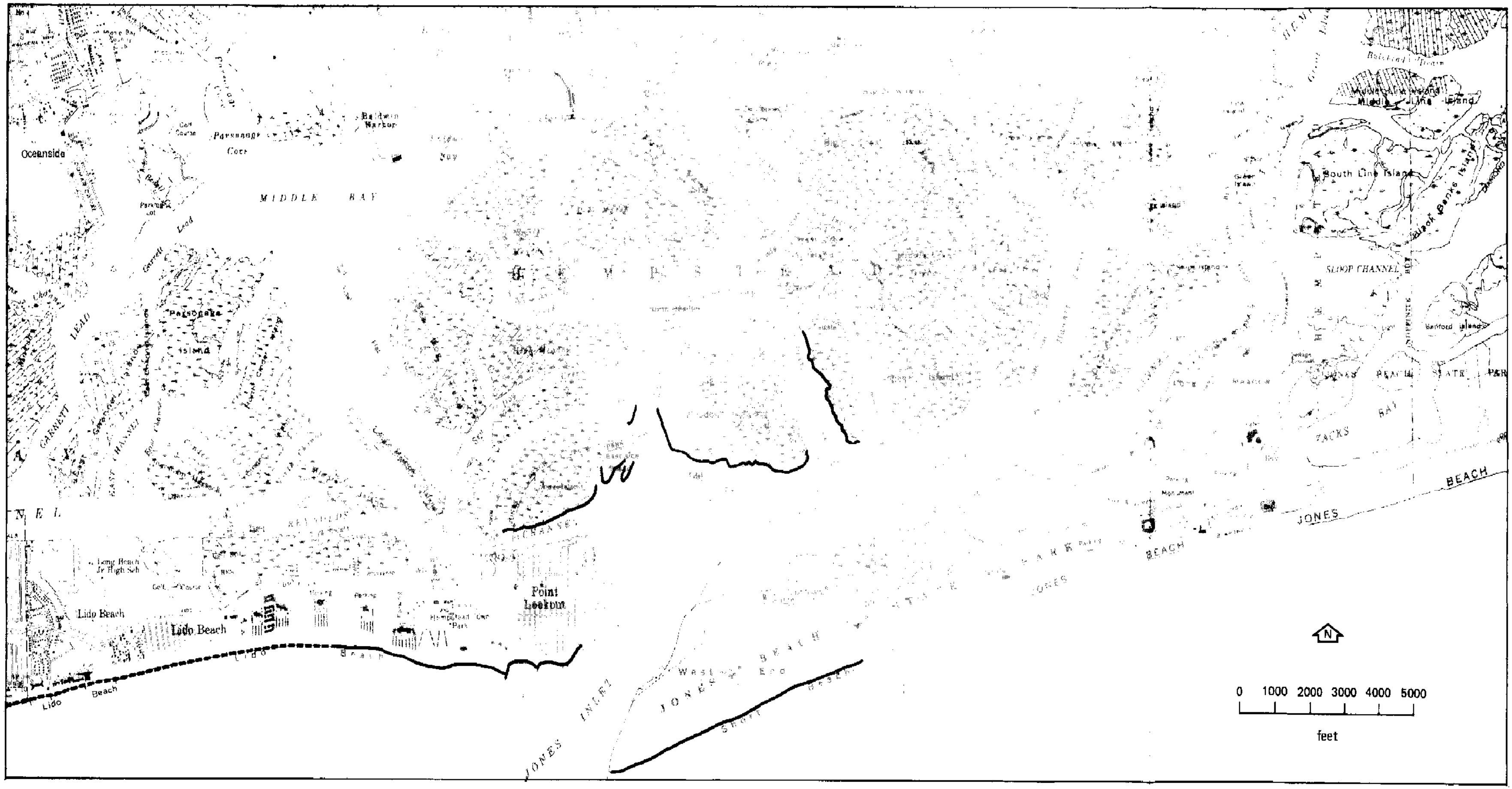
—— Shoreline contamination-initial flood tide (south wind)

- - - - Subsequent shoreline contamination due to longshore drift

—45— Hourly advance of oil (currents plus wind)

1.2⟶ Maximum flood tide currents (knots)

Figure 4. SHORELINE CONTAMINATION WITHOUT RESPONSE ACTION IMPLEMENTATION



LEGEND

- Shoreline contamination-initial flood tide (south wind)
- Subsequent shoreline contamination due to longshore drift

Figure 5. SHORELINE CONTAMINATION WITH RESPONSE ACTION IMPLEMENTATION

5.3 PRIORITY ANALYSIS

A large crude oil spill would have dramatic environmental effects on most of the area's resources making it difficult to establish which of these resources should receive protection and cleanup priority in the event of such a spill. Ecologically, all the bay wetland areas inside Jones Inlet should receive priority consideration. Not only are these marshlands susceptible to the toxic and smothering effects of spilled oil, but oil also tends to persist for longer periods of time in these areas. The extensive marshlands of Middle and East Bays are inhabited by marsh and rough legged hawks, louisiana, little blue, black crown night, and yellow crown night herons, and snowy, great, and cattle egrets. A significant hard clam population is supported in this bay system, particularly adjacent to the marshes, although shellfishing is prohibited in many areas due to water quality problems.

Since the beaches surrounding Jones Inlet are visited by large numbers of people during the warmer months, they too should receive priority consideration. Oil on these beaches or in the near shore zone would drastically curtail visitor use. During the winter months recreational use of these beaches is almost nonexistent, meaning greater priority could be given to the marsh areas where spilled oil would create more long-term problems.

The 120 or so marinas which ring Middle, East, and Hempstead Bays should also receive priority consideration. Residential and commercial shoreline, which is extensive on the north shore of Middle and East Bays, would fall under lower priority and receive secondary consideration during spill containment and cleanup.

5.4 RESPONSE ACTIONS

Response to an oil spill typically includes attempts to contain the spilled oil, to exclude it from environmentally sensitive areas, and to remove it. When considering overall impact, response actions that limit the area of oil contamination are most significant. For the scenario in question, feasible protection response actions to the predicted movement of the spilled oil were considered. These actions were developed by setting priorities for sensitive areas which might be impacted by spilled oil. Type and amount of oil spill equipment available in the New York area, prevailing environmental conditions (water depth, current velocities, access, areas of natural oil accumulation), and spill response times were all considered in determining the feasibility of the responses.

Due to the high current speeds (up to 1.8 knots) which occur in Jones Inlet standard booming techniques were not considered feasible in the inlet. Therefore, oil passing through Jones Inlet must be allowed to migrate to more quiescent waters inside the inlet before it can be contained or cleaned up. Once oil entered Jones Inlet it would move in three basic directions: up Reynolds Channel, Long Creek Channel, or Sloop Channel. Diversion and exclusion booms placed along these channels at creek and marsh entrances and in between islands would limit the spread of the slick and prevent contamination of the extensive marshlands of Middle, East, and South Oyster Bays. Small skimmers and vacuum trucks could be used in conjunction with these booms to collect oil at points of natural accumulation. Table 1 gives the spill response actions for Reynolds Channel. Response action locations, lengths and types of boom required, equipment and manpower requirements, boom placement times, and first day response action costs are included in the table. Spill response actions for Long Creek Channel and Sloop Channel are given in Tables 2 and 3, respectively. Figure 6 shows the locations of booming sites and points where vacuum trucks or units could be placed on the shoreline to recover oil for all three channels.

Self-propelled skimmers could be positioned in the more quiescent waters inside the inlet to pick up oil. Attaching "V" booms to the skimmers would increase their efficiency. Probable locations for these skimmers are shown in Figure 6.

Tables 4, 5, and 6 give the estimated total response times for boom deployment at each location for two different cases. The first case takes into account a 4.5 hour average response time for local spill contractors to transport their equipment to the Town of Hempstead Marina at Point Lookout (average taken from Table 7 Response Times for Oil Spill Contractors in the Jones Inlet Area) and get the equipment into the water. Travel time to the boom deployment location, the time required to deploy the boom once on site, and a lag time are added to the initial 4.5 hours to give a total response time. A lag time is added to some of the response action times because it is highly unlikely that a separate boat would respond simultaneously to each booming location. Therefore, response action priorities based on environmental sensitivity and values determine which sites are responded to first. In situations where response time is minimal prior to oil contamination, actions at primary sites would be executed first, followed by secondary site actions.

The total response times in Tables 4, 5, and 6 were calculated using 6 boats for boom deployment: 2 each in Reynolds, Long Creek, and Sloop Channels. Booms would be placed in the water at the Town of Hempstead Marina at Point Lookout and towed to the various booming locations. These 6 boats would be able to deploy booms at all the spill response sites in roughly 12 hours. With adequate notification, boom response actions for this scenario would be completed well in advance of the oil slick's arrival. Since sufficient response time is available, booming would not have to follow a priority sequence. It would also be unnecessary to use more than 6 boats for boom deployment. These 6 boats would eventually remain and tend boom at the 6 locations where diversion booms are deployed. Using only 6 boom boats would also help to limit traffic in and around the marina. Having more than this number of boats towing boom would create a congested situation which would delay response times and increase the risk of accidents.

Case 2 is predicated on 15,050 feet of boom (total boom requirement from Tables 1, 2, and 3) being stored at the Town of Hempstead Marina at Point Lookout for deployment by local response teams such as the Town of Hempstead Department of Conservation and Waterways or U.S. Coast Guard. Travel time to the boom deployment location and time required to deploy the boom once on site, added to a 1.5 hour mobilization time, make up the total response times for each location in Case 2. In both cases, vacuum truck responses to the scene would require between 3 to 10 hours.

The total response times given are for optimum conditions. Calls for assistance during other than working hours (nights and weekends), poor road conditions, heavy road traffic, or inclement weather could increase these times by a factor of two or three.

The estimated costs for implementation of spill response actions at each location during the first day (10 working hours) are given in Tables 1, 2, and 3. The total amount of equipment required and their rental costs are listed in Table 8. Total number of man-hours required and labor rates are given in Table 9. The $33,550 equipment rental cost and $13,650 labor cost give a total first day response action cost of approximately $47,000. This daily total cost would probably increase on subsequent days as additional booms, boats, and vacuum trucks were used and shoreline cleanup operations initiated.

Table 1. BOOMING LOCATIONS AND EQUIPMENT/MANPOWER REQUIREMENTS - REYNOLDS CHANNEL

Booming Location	Length and Boom Type Required	Equipment and Manpower Required to Deploy and Maintain Booms and Skim Oil[1]	Boom Placement Time From Point Lookout Marina	First Day Response Action Cost[2]
Primary Booming Locations				
1. Point Lookout Marina-Exclusion Booming	800 ft Optimax Curtain Boom	1 - Boat w/2 - man crew would remain to tend boom and let boats in and out of marina 3 - Anchors	0.6 hr	$1000
2. Loop Parkway Bridge - Diversion Booming	700 ft Optimax Curtain Boom	1 - Boat w/2-man crew would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 3 - Anchors	0.6 hr	$1400
3. Alder Island Creek Entrances - Exclusion Booming	300 ft Optimax Curtain Boom (150 ft per creek entrance)	1 - Boat w/2-man crew 4 - Anchors	0.8 hr	$ 350
Secondary Booming Locations				
4. Shore to Middle Island - Exclusion Booming	700 ft Optimax Curtain Boom	1 - Small skimmer w/2-man crew on shore 1 - Boat w/2-man crew 1 - 500 Gal. pillow tank[3] 3 - Anchors	0.75 hr	$1200
5. Middle Island to Long Meadow Island - Exclusion Booming	800 ft Optimax Curtain Boom	1 - Boat w/2-man crew 3 - Anchors	0.75 hr	$ 500
6. Long Meadow Island to Alder Island - Exclusion Booming	450 ft Optimax Curtain Boom	1 - Boat w/2-man crew 3 - Anchors	0.7 hr	$ 400
Reynolds Channel Entrance - Skimmer w/"v" booms	200 ft Optimax Curtain Boom (2 - 100 ft sections w/each skimmer)	2 - Boats each w/2-man crew 1 - Self-propelled skimmer w/2-man crew	0.2 hr	$3900

[1]Source: C.R. Foget et al., 1979.

[2]Source: Appendix B

[3]Flexible, portable, rubber storage bag.

Table 2. BOOMING LOCATIONS AND EQUIPMENT/MANPOWER REQUIREMENTS-LONG CREEK CHANNEL

Booming Location	Length and Boom Type Required	Equipment and Manpower Required to Deploy and Maintain Booms and Skim Oil[1]	Boom Placement Time From Point Lookout Marina	First Day Response Action Cost[2]
Primary Booming Locations				
7. Alder Island Creek Entrances - Exclusion Booming	400 ft Optimax Curtain Boom (200 ft per creek entrance)	1 - Boat w/2-man crew 4 - Anchors	1.0 hr	$ 350
8. Loop Parkway Bridge #1- Diversion Booming	700 ft Optimax Curtain Boom	1 - Boat w/2-man crew - would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 3 - Anchors	0.75 hr	$1800
9. Loop Parkway Bridge #2- Diversion Booming	600 ft Optimax Curtain Boom	1 - Boat w/2 man-crew - would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 3 - Anchors	0.75 hr	$1700
Secondary Booming Locations				
10. Sea Dog Creek - Exclusion Booming	450 ft Optimax Curtain Boom	1 - Boat w/2-man crew 3 - Anchors	1.0 hrs	$ 400
11. High Meadow to North Meadow - Exclusion Booming	1500 ft Optimax Curtain Boom	1 - Boat w/3-man crew 6 - Anchors	1.5 hrs	$1000
12. North Meadow Channel - Exclusion Booming	450 ft Optimax Curtain Boom	1 - Boat w/2-man crew 3 - Anchors	1.0 hr	$ 400
Long Creek Channel Entrance - Skimmers w/"v" booms	400 ft Optimax Curtain Boom (2 - 100 ft sections w/each skimmer	4 - Boats each w/2-man crew 2 - Self-propelled Skimmers w/2-man crew	0.4 hr	$7800

[1]Source: C.R. Foget et al., 1979.

[2]Source: Appendix B

Table 3. BOOMING LOCATIONS AND EQUIPMENT/MANPOWER REQUIREMENTS - SLOOP CHANNEL

Booming Location	Length and Boom Type Required	Equipment and Manpower Required to Deploy and Maintain Booms and Skim Oil[1]	Boom Placement Time From Point Lookout Marina	First Day Response Action Cost[2]
Primary Booming Locations				
13. Swift Creek - Diversion Booming	800 ft Optimax Curtain Boom	1 - Boat w/2-man crew - would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 4 - Anchors	1.7 hrs	$1500
14. Meadowbrook Parkway Bridge - Diversion Booming	1500 ft Optimax Curtain Boom	1 - Boat w/3-man crew - would remain to tend boom 1 - Vacuum truck and 2-man crew w/small skimmer on shore 6 - Anchors	1.75 hrs	$1800
Secondary Booming Locations				
15. Wife Lead - Exclusion Booming	400 ft Optimax Curtain Boom	1 - Boat w/2-man crew 3 - Anchors	1.7 hrs	$ 500
16. Haunts Creek Exclusion Booming	1200 ft Optimax Curtain Boom	1 - Boat w/3-man crew 5 - Anchors	2.0 hrs	$ 800
17. Deep Creek Meadows to Snipe Island - Exclusion Boooming	300 ft Optimax Curtain Boom	1 - Boat w/2-man crew 2 - Anchors	2.0 hrs	$ 400
18. Snipe Island to Green Island - Exclusion Booming	800 ft Optimax Curtain Boom	1 - Boat w/2-man crew 4 - Anchors	2.5 hrs	$ 650
19. Wantagh Parkway Bridge - Exclusion Booming	800 ft Optimax Curtain Boom	1 - Boat w/2-man crew 4 - Anchors	2.6 hrs	$ 650
Sloop Channel Entrance- Skimmers w/"v" booms	800 ft Optimax Curtain Boom (2-100 ft sections w/each skimmer)	8 - Boats each w/2-man crew 4 - Self-propelled skimmer w/2-man crew	1.0 hr	$15300

[1] Source: C.R. Foget et al., 1979.

[2] Source: Appendix B

LEGEND

- (1) Primary booming location and number
- (4) Secondary booming location and number
- ● Shoreline oil recovery point for small skimmer and vacuum truck or storage tank
- Skimmer with "V" booms

Figure 6. RESPONSE ACTION LOCATIONS

Table 4. DEPLOYMENT TIMES FOR REYNOLDS CHANNEL RESPONSE ACTIONS

Booming Location	Travel Time to Boom Deployment Location	Time Required to Deploy Boom at Location	Lag Time	Case 1. Total Response Time by Contractors with Equipment from their Home Base (Includes a 4.5 hour Average Minimum Response Time to Hempstead Marina--Booms and Boats in Water)	Case 2. Total Response Time by Town of Hempstead Department of Conservation and Waterways with Equipment Stored at Hempstead Marina (Includes a 1.5 hour Average Minimum Response Time--Booms and Boats in Water)
Loop Parkway Bridge	0.1 hr	0.5 hr		5.1 hrs	2.1 hrs
Alder Island Creek Entrances	0.1 hr	0.7 hr	0.7 hr	6.0 hrs	3.0 hrs
Shore to Middle Island	0.25 hr	0.5 hr	1.6 hrs	6.9 hrs	3.9 hrs
Middle Island to Long Meadow Island	0.25 hr	0.5 hr	2.4 hrs	7.7 hrs	4.7 hrs
Long Meadow Island to Alder Island	0.2 hr	0.5 hr	3.6 hrs	8.8 hrs	5.8 hrs

Table 5. DEPLOYMENT TIMES FOR LONG CREEK CHANNEL RESPONSE ACTIONS

Booming Location	Travel Time to Boom Deployment Location	Time Required to Deploy Boom at Location	Lag Time	Case 1. Total Response Time by Contractors with Equipment from their Home Base (Includes a 4.5 hour Average Minimum Response Time to Hempstead Marina--Booms and Boats in Water)	Case 2. Total Response Time by Town of Hempstead Department of Conservation and Waterways with Equipment Stored at Hempstead Marina (Includes a 1.5 hour Average Minimum Response Time--Booms and Boats in Water)
Alder Island Creek Entrances	0.25 hr	0.7 hr		5.5 hrs	2.5 hrs
Loop Parkway Bridge #1	0.25 hr	0.5 hr	1.2 hrs	6.5 hrs	3.5 hrs
Loop Parkway Bridge #2	0.25 hr	0.5 hr	2.2 hrs	7.5 hrs	4.5 hrs
Dog Creek	0.5 hr	0.5 hr	3.2 hrs	8.7 hrs	5.7 hrs
High Meadow to North Meadow	0.5 hr	1.0 hr	4.7 hrs	10.7 hrs	7.7 hrs
North Meadow Channel	0.5 hr	0.5 hr	6.7 hrs	12.2 hrs	9.2 hrs

Table 6. DEPLOYMENT TIMES FOR SLOOP CHANNEL RESPONSE ACTIONS

Booming Location	Travel Time to Boom Deployment Location	Time Required to Deploy Boom at Location	Lag Time	Case 1. Total Response Time by Contractors with Equipment from their Home Base (Includes a 4.5 hour Average Minimum Response Time to Hempstead Marina--Booms and Boats in Water)	Case 2. Total Response Time by Town of Hempstead Department of Conservation and Waterways with Equipment Stored at Hempstead Marina (Includes a 1.5 hour Average Minimum Response Time--Booms and Boats in Water)
Swift Creek	1.0 hr	0.7 hr	3.4 hrs	9.6 hrs	6.6 hrs
Meadowbrook Parkway Bridge	0.75 hr	1.0 hr	5.8 hrs	12.0 hrs	9.0 hrs
Wife Lead	1.1 hrs	0.5 hr	3.2 hrs	9.3 hrs	6.3 hrs
Haunts Creek	1.2 hrs	0.75 hr	-	6.5 hrs	3.5 hrs
Deep Creek Meadows to Snipe Island	1.5 hrs	0.4 hr	-	6.4 hrs	3.4 hrs
Snipe Island to Green Island	1.7 hrs	0.7 hr	-	6.9 hrs	3.9 hrs
Wantagh Parkway Bridge	1.8 hrs	0.7 hr	4.1 hrs	11.1 hrs	8.1 hrs

Table 7. RESPONSE TIMES FOR OIL SPILL CONTRACTORS IN THE JONES INLET AREA (TO POINT LOOKOUT MARINA)

Contractor	Distance to Inlet	Mobilization Time[1]	Travel Time[2]	Boom Deployment Time[3]	Boat Deployment Time	Total Response Time
Clean Harbors (Verrazano Bridge)	24 mi	1.5 hrs	.5 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.25 to 4.25 hrs
Clean Harbors (Upper Arthur Kill)	32 mi	1.5 hrs	.75 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.5 to 4.5 hrs
Clean Harbors (Perth Amboy)	39 mi	1.5 hrs	1 hr	Compactible--1 hr Standard--2 hrs	.25 hr	3.75 to 4.75 hrs
Clean Venture (Linden)	35 mi	1.5 hrs	1 hr	Standard--2 hrs	.25 hr	4.75 hrs
Coastal Services (Elizabeth)	32 mi	1.5 hrs	.75 hr	Standard--2 hrs	.25 hr	4.5 hrs
Marine Pollution Control (Port Jefferson)	48 mi	1.5 hrs	1.25 hrs	Standard--2 hrs	.25 hr	5 hrs
Clean Water (Toms River)	85 mi	1.5 hrs	2 hrs	Standard--2 hrs	.25 hr	5.75 hrs
AAA Pollution (Long Island City)	23 mi	1.5 hrs	.5 hr	Standard--2 hrs	.25 hr	4.25 hrs
Moran-Crowley (Carteret)	38 mi	1.5 hrs	1 hr	Standard--2 hrs	.25 hr	4.75 hrs

[1]Includes .5 hrs for notification and 1 hr to get equipment on the road.

[2]Average speed of 40 mph.

[3]Time required to unpack, assemble, and launch 1,000 ft of boom.

Table 8. EQUIPMENT RENTAL COST FOR ONE 10-HOUR DAY

Equipment	Amount/Number Required	Rental Cost	Total
Boom	15,050 ft	$ .35/ft	$ 5,300
Work Boats	20	200/day	4,000
Small Skimmers	7	50/day	350
Vacuum Trucks	6	300/day	1,800
Storage Tank	1	200/day	200
JBF 3003 Skimmer	4	4,000/day	16,000
JBF 3001 Skimmer	1	2,300/day	2,300
Bennett MK6E Skimmer	1	2,600/day	2,600
Marco Class ID Skimmer	1	1,000/day	1,000
	TOTAL		$ 33,550

Table 9. LABOR COST FOR ONE 10-HOUR DAY

Activity	Man Hours Required in 10-Hour Day	Labor Rate	Total
Boom Deployment	130	$ 15.00/hr	$ 1,950
Boom Maintenance	140	15.00/hr	2,100
Skimmer Maintenance	140	15.00/hr	2,100
Vacuum Truck Support	60	15.00/hr	900
Self-Propelled Skimmer	140	15.00/hr	2,100
"V" Boom Boats	280	15.00/hr	4,200
Miscellaneous	20	15.00/hr	300
Total	910	Total	$ 13,650

Spill response activities within Jones Inlet after the first day are not within the scope of this analysis because of the difficulty in predicting spill behavior once oil has contacted a shoreline. However, cleanup of oil on the water and from shorelines could not be completed in just one day. Equipment would have to remain in place for 1-2 weeks.

The use of conventional containment and skimming techniques would be ineffective in preventing contamination of the beaches east and west of Jones Inlet. The most feasible method to prevent or reduce this contamination would be to apply dispersants to the slick while it is still offshore, providing the oil is amenable to dispersant treatment. These dispersants can be applied by both aircraft and vessels. When the slick is chemically treated with dispersants, the oil is broken up into small droplets which mix into the water column and form a plume below the water surface. Sufficient wave energy is necessary for dispersants to work effectively. Subsurface currents, which generally tend to move along shore to the west, could carry some of the dispersed oil onto the barrier island beaches or through Jones Inlet. A decision to use dispersants would have to be made quickly, since a minimum of 24 to 36 hours would be required to implement a dispersant spraying operation.

To lessen contamination of the ocean beaches, a 2-3 foot high berm could be constructed parallel to the shoreline at the midtide line. Motor graders would be best suited for berm construction, although bulldozers would be adequate also. Maintenance of the berm would include possible daily reconstruction.

5.5 EQUIPMENT PERFORMANCE

The booms listed in Tables 1 through 3 for each response action are the type of boom which have performance characteristics (stability and shallow draft water use) best suited for the type of booming actions required. Over 20,000 ft. of the recommended boom type is available for use through local spill contractors in the area, which is greater than the 15,050 ft. of boom required to carry out the necessary response actions.

The 6 small skimmers which would be used in conjunction with booms at points of natural oil accumulation would be able to pick up oil at a rate of approximately 7,800 gallons per day.

The use of self-propelled skimmers is limited to the main channels where the 4 to 6 foot operational depth necessary is present. The use of "V" booms with these skimmers increases their oil encounter rate by increasing their skimming width. The encounter rate is the volume of oil that a skimmer will encounter on a water surface over a given period of time. Factors influencing the encounter rate include the thickness of the oil slick on the water, the skimming path width, and the skimmer's forward speed. Skimming without booms can be performed effectively at speeds of up to 2 knots. Using "V" booms, skimmers would skim at approximately 1 knot so that oil would not be lost underneath the diversion booms. By deploying two short booms (each 100 feet in length) from each side of a skimmer's bow the effective sweep width of a skimmer can be increased by a factor of four (that is a skimmer with a skimming width of 15 feet can skim with a 60 foot width). The major drawback to conducting this type of skimming is the difficulty in coordinating the maneuvering of three vessels in the restricted channels and the slower (1 kt) skimming speed. Table 10 lists performance criteria for four types of self-propelled skimmers which are currently available in the New York area (4 JBF 3001, 1 Bennett Mark VI, 1 Marco Class ID). Table 11 gives the daily oil recovery rates that might be expected from these skimmers with and without "V" booms. A total of approximately 43,900 gallons of oil could be picked up per day by the seven self-propelled skimmers. The rates given are average theoretical values

Table 10. SKIMMER PERFORMANCE CRITERIA

Skimmer	Water Depth Needed for Skimmer	Skimming Speed	Max. Oil Pickup Capability	Skimming Width	Skimming Width w/"v" Boom	On-Board Storage Capacity	Off-Loading Capacity	Oil Recovery Factor[1]		Oil Content Factor[2]	
								Diesel	Crude	Diesel	Crude
JBF - 3003	6 ft	0-3 kts	450 GPM	18 ft	72 ft	4000 gal	450 GPM	65%	80%	40%	60%
JBF - 3001	4 ft	0-3 kts	100 GPM	15 ft	60 ft	1500 gal	50 GPM	65%	80%	40%	60%
Bennett Mark 6E	6 ft	1-2 kts	350 GPM	14 ft	56 ft	2500 gal	350 GPM	88%	88%	52%	60%
Marco Class ID	6 ft	1-2 kts	50 GPM	10 ft	40 ft	500 gal	50 GPM	65%	80%	40%	60%

<u>Volume of Oil Recovered</u>

[1] Oil Recovery Factor = Volume of oil presented to skimmer.

[2] Oil Content Factor = Percentage of oil in the liquid recovered by skimmer.

Source: L.B. Solsbery et al., 1977; W.F. Purres and L. Solsbery 1978; W.J. Logan et al., 1975.

Table 11. OIL RECOVERY EFFECTIVENESS OF SKIMMERS FOR CRUDE OIL SPILL

Skimmer	Actual Oil Recovery Rate Gallons/Hr[1]		Hours of Operation Until Storage Capacity is Reached[2]		Time Required to Offload at Point Lookout Marina,[3] Hours	Total Amount of Oil That Could be Recovered In 10-Hour Day (gallons)		Average Daily Oil Recovery[4] (gallons/day)		Number of Skimmers Available in the New York Area	Total Daily Oil Recovery (gallons/day)	
	Skimmer Only	Skimmer w/"V" Booms	Skimmer Only	Skimmer w/"V" Booms		Skimmer Only	Skimmer w/"V" Booms	Skimmer Only	Skimmer w/"V" Booms		Skimmer Only	Skimmer w/"V" Booms
JBF 3003	1,310	2,620	2.2	1.1	1.0	8,650	13,000	6,500	7,800	4	14,000	31,200
JBF 3001	1,090	2,180	1.0	0.5	1.25	5,450	6,500	4,100	4,500	1	4,100	4,500
Bennett Mark 6E	1,020	2,040	1.75	0.9	1.0	6,500	10,000	4,900	6,000	1	4,900	6,000
Marco Class ID	730	1,450	.50	0.25	1.0	2,600	3,000	2,000	2,200	1	2,000	2,200
										TOTAL	25,000	43,900

[1]Actual Recovery Rate = Encounter Rate x Oil Recovery Factor - Encounter Rate calculated from skimming speed of 2 kts for free skimming and 1 kt for skimming with booms, sweep width, and oil thickness - Oil Loading: Crude Oil Thickness of 0.32 mm.

[2]Adjusted for oil content factor.

[3]Includes travel time to and from skimming area.

[4]Adjusted for downtime and maneuvering.

[5]Recovery rates would increase significantly if skimmers could be offloaded by barge at the skimming site.

over the period of operation. Initially, oil recovery rates would be higher and would decrease with time as the slick breaks up and dissipates. Actual recovery rates in a real spill could vary considerably from these average values depending on weather conditions, presence of debris, local concentrations of oil, slick thickness, etc.

5.6 SPILL RESPONSE ASSESSMENT

Under the conditions set forth in the scenario, 40 hours would elapse before the oil slick would reach Jones Inlet. An additional 1 to 9 hours would be needed for the slick to travel from Jones Inlet to the various marsh areas. This should be more than sufficient time to implement the response actions listed in Tables 1 through 3 for either the contractor or local response team cases. Although oil cannot be prevented from entering Jones Inlet, contamination of all but a small percentage of the wetlands within the inlet can be averted through the use of self-propelled skimmers, vacuum trucks, and exclusion and diversion booming.

If a spill were to impact the area during spring tide, high water, the tide would be high enough to flood the marsh islands. Under these circumstances, the booming of channels would be ineffective in preventing oil from entering the marshes. Exclusion booming around entire marsh areas is thought to be impractical.

5.7 MOSQUITO DITCHES

Numerous mosquito ditches approximately 4 to 6 feet wide bisect the marshlands of Middle, East, and South Oyster Bays. These ditches would provide pathways for oil to contaminate the interior of the marshlands. Although current measurements were not taken in these narrow channels, their placement and geometry suggest that currents in these ditches are probably less than 0.25 to 0.3 of a knot. Two or three sorbent boom sections (each 8 feet long) placed in parallel lines across the ditch openings should be sufficient in excluding oil.

The sorbent boom sections can be anchored to each side of the ditch by wooden or metal stakes driven into the bank. All mosquito ditches should be boomed which are located in front of the diversion booms along Reynolds Channel, Long Creek, Swift Creek, and Sloop Channel. It would require approximately 0.5 hour for a 2-man crew in a shallow draft boat to place 2 or 3 sorbent boom segments across the opening to a mosquito ditch.

5.8 DISPERSANT USE

Oil contamination of Lido, Short, Long, Atlantic, and other shoreline beaches could be prevented or effectively reduced by chemically treating the slick while still offshore. Steps should be taken to assemble dispersant application equipment and personnel immediately in the event of a major spill. The decision making process leading to use of this alternative should be initiated immediately. The decision to use dispersants should be made pending analysis of spill conditions and relative threats posed to the environment. This alternative is most practical during the summer months when visitor usage of these beaches is at its peak and the effects of beach contamination would be at a maximum.

SECTION 6 REFERENCES

Foget, C.R., E. Schrier, M. Cramer, and R. Castle. 1979. Manual of Practice for Protection and Cleanup of Ocean, Estuarine and Inland Shorelines, U. S. Environmental Protection Agency. (In Press).

Hardy, C.D., E.R. Baylor, P. Moskowitz and A. Robbins. 1975. The Prediction of Oil Spill Movement in the Ocean South of Nassau and Suffolk Counties, New York. Tech. Rep. Series No. 21. Stony Brook, N.Y., Marine Science Research Center.

Logan, W.J., C.W. Ross, and L.D. Solsbery. 1975. Report on Mechanical Oil Recovery Equipment. Canadian Environmental Protection Service.

Long Island Regional Planning Board. 1979. Oil Spill Response Actions in Fire Island Inlet, County of Suffolk, New York. Hauppauge, N.Y. Task 5.2 report, contract D142688.

Mackay, D. et al. Calculation of the Evaporation Rate of Volatile Liquids. Hazardous Materials Spills Conference, 1980, p. 301.

N.Y.S. Department of Environmental Conservation. 1977. New York State and Outer Continental Shelf Development - An Assessment of Impacts. Albany, N.Y.

Norman Porter Associates. 1964. Tide and Current Studies, Jones Inlet and Vicinity, Nassau County, Long Island, New York.

Premack, J. and G. Brown. 1973. "Predictions of Oil Slick Motions in Narragansett Bay." 1973 Conference on Prevention and Control of Oil Spills. Washington, D.C.

Purres, W.F. and L.B. Solsbery. 1978. Pumps for Oil Spill Cleanup. Canadian Environmental Protection Service.

Solsbery, L.B., W.G. Wallace, and M.P. Dunne. 1977. Field Evaluation of Oil Spill Recovery Devices: Phase II. Canadian Environmental Protection Service.

Stewart, R.J. and J.W. Devanney III. 1974. Probabilistic Trajectory Assessment for Offshore Oil Spills Impacting Long Island. Cambridge, Mass., Massachusetts Institute of Technology.

Tetra Tech, Inc. 1980a. Analysis of Link-Node Model Results for Jones Inlet. Long Island Regional Planning Board, Hauppauge, N.Y. Task 2.1 technical memorandum, contract D164093.

Tetra Tech, Inc. 1980b. Littoral Forces Within the Jones Inlet Study Area That May Influence the Selection and Effectiveness of Oil Spill Contaminent and Cleanup Equipment. Long Island Regional Planning Board, Hauppauge, N.Y. Task 1.1 report, contract D164093.

U.S. Coast Guard. 1977. Subregional Oil Spill Contingency Plan. USCG Group Rockaway, Rockaway, New York.

Vanderkooy, N., A. Robertson, and C.J. Beckett. 1976. Evaluation of Oil Spill Barriers and Deployment Techniques. Canadian Environmental Protection Service. January 1976.

APPENDIX A

Review of Comments Submitted by Agencies and Firms with an Interest in Oil Spill Control

1. Nassau County Department of Health

Comment: The equipment inventory does not indicate which boats are available for service on the south shore.

Response: It is very difficult to ascertain the exact location of each piece of equipment since the agencies tend to move their equipment according to their needs. It appears there will be ample boats for boom deployment.

Comment: The Nassau County Police Department has more equipment than listed.

Response: The draft inventory was based on information supplied by the N.C.P.D. and was updated for the final report.

Comment: Why not use Short Beach as a deployment site instead of Pt. Lookout?

Response: The report identifies Pt. Lookout as a deployment site because of the facilities and equipment located there. This does not preclude the use of Short Beach as well as other sites for equipment deployment.

Comment: It is unclear where sorbent fence should be deployed.

Response: The report was revised to clarify this point.

Comment: Why are marinas identified as a second level priority?

Response: The first priority is the protection of marshes and wetlands. This report identifies actions to be taken during the first tidal cycle, it is likely that the back bay areas will not be affected during this time. Since marinas contain a great deal of valuable private property and are relatively easy to protect they were identified as a secondary protection area. Additional responses that may aid in the protection of personal property can be found in the St. Lawrence - Eastern Ontario Commission's Report "Coping with Oil Spills."

Comment: The model used to predict oil slick movement only approximates the slick's edge of penetration.

Response: This is recognized in the report and was determined by the oil spill consultants to be sufficient for planning purposes.

2. New York State Department of Environmental Conservation

Comment: If the decision is made to apply chemical dispersants to the oil slick, when should they be applied?

Response: As soon as possible. Dispersants work best on unweathered oil. Also, the environmental impacts of the dispersant can be expected to be less in deeper water.

Comment: There should be a discussion of possible means for handling boat and vehicular traffic.

Response: The report identifies the possible needs for traffic control. Should boat traffic hamper response actions the Coast Guard has the authority to control this traffic.

Comment: More shellfish areas are open than may be implied.

Response: The text was revised to reflect this point.

Comment: Specific recommendations for berming should be added.

Response: According to EPA shoreline protection procedures, berms should be located at the midtide line. Berms should be constructed of material taken from the beach seaward of the berm.

Comment: It is not clear why contaminated wastes should not be burned.

Response: Burning of oil contaminated wastes creates air pollution problems.

Comment: The scenario has been presented as a 'worst case' when, in fact, the worst case may be a spill closer to Jones Inlet. How would a smaller "closer-in" spill change the recommended response.

Response: The worst case scenario described was selected because it is based on the characteristics of oil tanker traffic in the New York Bight. A "closer-in" spill would most likely involve less oil. If such a spill did occur and oil was about to enter the inlet it would be best to begin exclusion booming in the back bay areas.

Comment: Due to the lead time required for implementing a dispersant system permission should be secured, in advance, to use dispersants.

Response: Use of dispersants is regulated by the Federal Government, which will not grant blanket approval to use dispersants. One of the criteria used in determining if dispersants should be used is the degree of difficulty expected in controlling the spill by mechanical means. This report documents the difficulty in using mechanical means to control an oil spill impacting Jones Inlet and can be used as input into the decision process regarding the use of dispersants.

Comment: The report does not recommend specific agency activities.

Response: Decisions regarding actions to be taken by various agencies would be made by the U.S. Government's On-Scene Coordinator.

Comment: It is not clear why Loop and Meadowbrook Parkways were designated for diversion booming where adjacent current velocities seem to be below maximum current speeds for Optimax boom.

Response: The currents in these channels approach the maximum velocities for which exclusion booming is effective. Thus diversion booming was recommended for these locations in an effort to keep oil out of marsh areas along Swift Creek and Sloop Channel.

Comment: The need for town cooperation in accepting out-of-town residues at lined landfills should be emphasized.

Response: See response to similar comment made by Town of Brookhaven.

3. N.Y.S. Department of Transportation

Comment: If oil was just outside the inlet what would the first action be?

Response: It may be best to begin exclusion booming in the back bay area. Exclusion booming should take place first. Depending upon weather conditions, diversion booming would be the second response.

Comment: If oil is stranded can it be bermed at midtide? Where should such an operation begin?

Response: See response to similar comment made by Department of Environmental Conservation.

4. Town of Brookhaven

Comment: In light of new requirements regarding landfills there may be no place to dispose of oils and oily wastes.

Response: Disposal may be the most expensive and difficult part of the spill clean-up. Various governments may have to cooperate to solve this problem. This report deals mainly with response actions during the first tidal cycle. Disposal of oily waste may present political problems requiring additional actions.

Comment: Who will transport the collected material to its final disposal location?

Response: Appendix C contains a discussion of disposal of recovered oil and oily waste material. This appendix contains a listing of approved waste oil collectors and haulers.

Comment: There should be a regular joint meeting of all involved parties with a mock drill in order to give many agencies the experience in responding to oil spills.

Response: This is a very reasonable suggestion, and such meetings and drills should be part of plan implementation.

5. Suffolk County Department of Health

Comment: Once a spill takes place at sea, to what extent can it be certain that other inlets will not be impacted?

Response: After a major spill has taken place it will take some time to determine slick direction and speed. This will in turn reduce response time. In the event of a major spill in variable weather conditions several south shore inlets may be threatened. Under such conditions it might be best to move equipment into a central location while tracking the slick before a final deployment decision is made.

6. Mobil Oil/N.Y.S. Petroleum Council

Comment: Availability of skimmers from Clean Harbor Cooperative may be exaggerated in the report.

Response: It is understood that delivery of several of Clean Harbors skimmers is pending.

Comment: It is unlikely that all of the equipment listed under various contractors and co-ops would be available at the same time.

Response: The response actions outlined in the report reflect a maximum effort. All of the equipment available may not be utilized due to congestion. Availability of co-op equipment may depend upon the source of the spill.

Comment: Response times may be unrealistic due to equipment requirements such as off-loading; set up and assembly. Equipment such as cranes, etc., may not be readily available at the site.

Response: Minimum response times are estimated. Bad weather, human error, etc., would result in longer times for deployment.

APPENDIX B

Part I - Inventory of Oil Spill Contractors and Equipment in the Long Island Region

In the event of an oil spill, an efficient and effective response is essential and can be achieved partially by familiarization with the contractors and equipment available for use in combatting oil spills. This Appendix identifies the local contractors and various operational aspects of oil spill equipment available in the Long Island area.

The type, manufacturer, quantity and location of the oil spill equipment owned by each contractor is listed in Table 1. Equipment which can be operated effectively in shallow water is denoted with an asterisk.

The rental costs for use of oil spill cleanup equipment are competitive and standardized throughout the industry. The costs are, however, subject to frequent change as are the equipment inventories of the various contractors. Table 2 gives the present rental costs for the equipment owned by two of the oil spill contractors listed in the previous table.

Equipment.

The primary types of equipment used in the containment and recovery of spilled oil are booms, skimmers and pumps. There are many varieties of each type of equipment available with some being better suited for certain purposes than others. A discussion of the characteristics of the different varieties of equipment is provided to enable the reader to determine which one is best suited for a specific purpose.

Booms. Booms are used primarily for containment or diverting spilled oil or for protecting areas from contamination. The brands of booms available from the various contractors are listed in Table 3 along with their specifications and capabilities.

Table 1. INVENTORY OF OIL SPILL CONTRACTORS EQUIPMENT

Clean Harbors Cooperative (Verrazano Bridge)(201) 738-2438

Booms

*9,000 ft	American Marine Optimax 7" x 12"
3,000 ft	Kepner Supercompactible Sea Curtain 12" x 18"
*5,000 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Skimmers

1	JDF 3003 self-propelled vessel
*1	Centrifugal Systems Oil Mop w/500' of rope
1	Marco Class JD self-propelled vessel

Boats

*4	Raider 34' work boats w/2 - 150 hp motors
*4	Orca 22' deployment boats w/2 - 85 hp motors

Oil/Water Separation Equipment

None

Clean Harbors Cooperative (Upper Arthur Kill)

Booms

*14,000 ft	American Marine Optimax 7" x 12"
* 3,500 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Skimmers

2	JBF 3003 self-propelled vessel
*1	Centrifugal Systems Oil Mop w/500' of rope

Boats

*1	Bennent 27' Sealander w/2 - 150 hp motors
*6	Orca 22' deployment boats w/2 - 85 hp motors

Oil/Water Separation Equipment

None

Clean Harbors Cooperative (Perth Amboy)

Booms

*13,000 ft	American Marine Optimax 7" x 12"
* 3,500 ft	Kepner Supercompactible Sea Curtain 8" x 12"

Table 1. Continued

Skimmers	
1	JBF 3003 self-propelled vessel
1	JBF 3001 self-propelled skimming vessel
1	Centrifugal Systems Oil Mop w/500' of rope
Boats	
1	Bennett 27' Sealander w/2 - 150 hp motors
5	Orca 22' deployment boats w/2 - 85 hp motors
Oil/Water Separation Equipment	
None	

AAA Pollution Specialist, Inc. (Long Island City, NY) 212-729-2122

Booms	
5,500 ft	Uniroyal Sealdboom 6" x 12"
*3,000 ft	American Marine Optimax 7" x 12"
Boats	
2	30 ft work boats
1	21 ft MAKO w/115 hp
*15	small work boats w/outboard motors
Skimmers	
*5	ACME Model 400 skimmers
*2	ACME FS-40 Electric skimmers
Oil/Water Separation Equipment	
4	3,000-5,000 gal vacuum trucks
3	4,400 gal tank trucks
5	3,000 gal tank trucks
Spill Response Trailers	
1	32' communications and repair trailer
Communication Systems	
6 sets	Walkie-talkies
3 sets	Mobile units (in vehicles)
1	55 channel marine band

Table 1. Continued

Advanced Environmental Technology Corp. (Morris Plains, NJ)
201-539-7111

A New York State licensed collector and transporter of hazardous wastes.

Booms

None

Boats

None

Skimmers

None

Oil/Water Separation Equipment

None

Spill Response Trailers

4	22' trucks
1	14' truck
5	44' trucks

Communication Systems

12 sets	Civilian band radios

Clean Venture (Linden, NJ) 201-862-5500

Booms

*13,000 ft	6" x 12" harbor boom
2,000 ft	12" x 24" Goodyear offshore inflatable high seas barrier boom

Boats

1	42' LCM twin screw 280 hp, 18 ton DWT
2	30' steel work boat
1	30' steel harbor tug
*6	22' work boats
*20	15'-19' work boats

Table 1. Continued

<u>Skimmers</u>

1	Bennett Mark 6E oil skimmer
*4	Swiss Oela skimmers
*4	Duck bill skimmers
*1	MK 209 oil mop skimmer & 300' mop

<u>Oil/Water Separation Equipment</u>

3	5,000 gal vacuum tractor trailer trucks
3	2,500 gal vacuum trucks (straight)
1	3,400 gal vacuum tractor trailer trucks
1	4,200 gal vacuum tractor trailer trucks

<u>Communication Systems</u>

10 sets	Communication trailer 8' x 35' roadable - marine and land lease communications (Motorola)
19 sets	Hand-held walkie-talkies

<u>Spill Response Trailer</u>

1	8' x 40' roadable - user: change area, eating area, first aid, shelter

<u>Clean Water, Inc. (Toms River, NJ) 201-341-3600</u>

Ship salvage and oil spill consultants - affiliated with Smit International (America), Inc.

<u>Booms</u>

* 4,000 bags	Filter Fence Sorbent C (Biodegradable) 4 cu ft 18 lb/bag
* 4,000 ft	5' filter boom (in one trailer)
2,250 ft	Harbor boom 8" x 24"
11,000 ft	Sea sentry boom 12" x 24"

<u>Boats</u>

None

<u>Skimmers</u>

None

<u>Oil/Water Separation Equipment</u>

2	12' x 4' x 5' API separators

Table 1. Continued

Spill Response Trailers	
1	40' parts trailer
Communication Systems	
3 sets	VHF 14 channel
8 sets	Walkie-talkies
Special Equipment	
* 1	K350 36" wide track front end loader (marshland work)
*14	Mortar pans (marshland work)
1	International boom truck w/winch and boom (marshland work)
Marine Pollution Control (Port Jefferson, NY) 516-473-9132	
Booms	
*5,000 ft	MPC harbor boom 6" x 12"
2,000 ft	Uniroyal Sealdboom 6" x 12"
Boats	
1	65' utility boat
1	60' crew boat
1	40' crew boat
3	56' LCM-6
1	50' LCM
*2	24' workboat
*2	18' outboard workboat
*2	12' aluminum workboat
1	Boston Whaler w/50 hp motor
1	Debris boat (Boatadozer)
1	80' salvage barge w/60 ton crane
1	10,000 gal vacuum barge
Skimmers	
*2	Parker weir type (Oil Hawg)
*2	Slurp weir type
Oil/Water Separation Equipment	
3	2,500 gal vacuum trucks
1	1,100 gal skid mounted vacuum unit
1	8,200 vacuum truck trailer & tractor

Table 1. Continued

Spill Response Trailers

None

Communication Systems

15 sets	VHF ship-to-shore units in boats and vehicles

Moran-Crowley Environmental Services Company (Carteret, NJ) 201-499-9777

Booms

*5,000 ft	Harbor boom 6" x 12"

Boats

*5	18' aluminum boats
*3	21' workboats

Skimmers

1	33' LPI skimmer
*2	Metropet skimmers

Oil/Water Separation Equipment

1	5,000 gal vacuum truck
2	3,000 gal vacuum trucks
1	3,000 gal stainless steel vacuum truck
7	5,000 gal stainless steel storage tanks

Spill Response Trailers

1	20' Command Port Travel-all

Communication Systems

6 sets	Walkie-talkies (marine band)
1 set	40 channel marine band

New England Pollution Control (Norwalk, CT) 203-853-1990

Booms

*2,000 ft.	Harbor boom 6" x 12"
2,000 ft.	Harbor boom 6" x 18"
*1,000 ft.	Inshore 6" x 6"

Table 1. Continued

Boats

*4	15 and 18' workboats (up to 40 hp)
1	65' work barge

Skimmers

*2	Swiss Oela
*6	Skim Pak
*2	Slick Bar Manta Ray

Oil/Water Separation Equipment

1	6,000 gal vacuum truck
1	3,500 gal vacuum truck
1	3,000 gal vacuum truck

Spill Response Trailers

1	24' Command trailer

Communication Systems

4	Hand-held Motorola (USCG Freq.) & base station

Peabody Clean Industry, Inc. (Perth Amboy) 201-925-6010 and Staten Island 212-729-2121

Booms

*2,200 ft.	Coastal boom 4" x 14"
2,300 ft.	Coastal boom 12" x 24"

Boats

1	16' aluminum whaler 100 hp
2	18' flat bottom boats 25 hp
*1	16' work boat 15 hp
*1	14' work boat

Skimmers

*2	Swiss Oela skimmer
*6	Slurp skimmer
1	Mash 400 skimmer
*3	Parker weir skimmers (Oil Hawg)

Table 1. Continued

Oil/Water Separation Equipment	
2	3,000 gal vacuum trucks (straight)
5	6,000 gal vacuum trucks (tractor trailer)
1	4,000 gal vacuum truck
2	3,500 gal vacuum trucks
1	Vactor unit (large material mover)
Spill Response Trailers	
1	Mobile Field Office & Communication Center (in Boston)
Communication Systems	
10 sets	Walkie-talkies

Table 2. EQUIPMENT RENTAL COSTS

Contractor and Equipment	Rental Costs
<u>Marine Pollution Control</u>	
All Boom	$0.33/ft/day ($1.15/ft cleaning)
Slurp Skimmer	$46.00
Parker Skimmer	$46.00/day
80 ft Salvage Barge w/ 60 ton Crane	$115.00/hour
65 ft Utility Boat	$60.00/hour
60 ft Crewboat	$60.00/hour
40 ft Crewboat	$50.00/hour
56 ft LCM-6	$60.00/hour
50 ft LCM	$60.00/hour
24 ft Workboat	$35.00/hour
18 ft Outboard Workboat	$15.00/hour
12 ft Aluminum Workboat	$85.00/day
Boston Whaler (50 hp)	$15.00/hour
Boatadozer	$35.00/hour
2,500 gal Vacuum Truck	$37.00/hour
1,100 gal Vacuum Unit (skid mount)	$29.00/hour
8,200 gal Vacuum Truck Trailer & Tractor	$51.00/hour
10,000 gal Vacuum Barge	$60.00/hour
<u>Clean Venture</u>	
Boom up to 18 in.	$0.35/ft/day
Boom over 18 in.	$0.40/ft/day
Bennet Mark 6E Skimmer	$260.00/hour
MK 209 Oil Mop	$70.00/hour

Table 2. Concluded

Contractor and Equipment	Rental Costs
Slurp Skimmer	$60.00/day
Swiss Skimmer	$60.00/day
Oil Hawg Skimmer	$300.00/day
Duckbill Skimmer	$60.00/day
30 ft Harbor Tug	$37.00/hour
22 ft Workboat	$28.00/hour
15-19 ft Power Workboats	$150.00/day
Vacuum Trucks (Tractor-Trailer)	$47.50/hour
Vacuum Trucks (Straight Job)	$41.00/hour
Vacuum Unit (Skid Mount)	$27.00/hour
Tractor Trailer w/Pumps	$33.50/hour

Skimmers. Skimmers are the primary means by which oil is recovered from the water surface. They work on a variety of principles with their effectiveness being dependent on the environmental conditions and oil type. Table 4 lists the skimmers available locally and their specifications and capabilities. The majority of skimmers are small, portable units with the remainder being mounted externally or internally to a vessel.

Pumps. Because of the wide variety of pumps available from each contractor, pumps have been listed by type rather than separately. Table 5 lists the pump type with a few manufacturer's names given for each. In general, centrifugal trash pumps are the most common and most widely used in oil spill cleanup with single and double diaphragm pumps also experiencing heavy use. Both are well suited due to their ability to pump heavy oils and pass limited amounts of debris. Even though centrifugal types have a high emulsification potential, this is a secondary consideration and does not affect the capacity of the pump. Other pumps are also well suited for oil spill cleanup but are not widely available. It should be noted, however, that rating pumps by type is not absolute as a few different models or manufacturers of the same pump type may have different capabilities than those listed in Table 6.

Table 3. BOOM CAPABILITIES

Boom	Boom Type	Freeboard	Draft	Max. Wave Height	Max. Current Speed	Stability	Shallow Water Use
Metropolitan Petroleum	Curtain	6 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Metropolitan Petroleum	Curtain	12 in.	24 in.	5 ft	1 kt	Moderate	Limited
Uniroyal Sealdboom	Fence	6 in.	12 in.	1-2 ft	1 kt	Poor	Poor
Coastal	Fence	6 in.	12 in.	1-3 ft	1 kt	Poor	Poor
Coastal	Fence	12 in.	24 in.	1-3 ft	1 kt	Poor	Poor
B.F. Goodrich	Fence	12 in.	24 in.	3-5 ft	1 kt	Good	Poor
Acme	Curtain	6 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Slickbar MK-6	Fence	6 in.	12 in.	1-3 ft	1 kt	Moderate	Poor
American Marine Optimax	Curtain	7 in.	12 in.	1-3 ft	1.5 kt	Good	Good
Kepner Supercompactible Sea Curtain	Curtain	8 in.	12 in.	1-3 ft	1 kt	Moderate	Good
Kepner Supercompactible Sea Curtain	Curtain	12 in.	18 in.	1-3 ft	1 kt	Moderate	Limited
Sea Sentry	Curtain	12 in.	24 in.	1-3 ft	1 kt	Good	Limited

Table 4. SKIMMER CAPABILITIES

Skimmer	Portable or Vessel Mounted	Effectiveness vs. Oil Type Light	Medium	Heavy	Solid	Max. Wave Height	Skimming Speeds[2]	Required Water Depth
JBF 3003	V.M.	High	Moderate to High	Low	Low	2-3 ft	0-3 kts	6 ft
JBF 3001	V.M.	High	Moderate to High	Low	Low	2-3 ft	0-3 kts	4 ft
Bennett Mk 6E	V.M.	High	Moderate	Low	Low	2-3 ft	1-2 kts	6 ft
Oela "Swiss"	P	Moderate to High	Moderate	Low	Not Effective	6"	NA	8"
Slurp	P	Low	Moderate	Moderate	Not Effective	1 ft	NA	1 ft
Oil Hawg	P	Low	Moderate	Moderate to High	Not Effective	6"	NA	6"
Oil Mop	P	High	High	[1]Low to Moderate	Not Effective	6"	NA	6"
Manta Ray	P	Low	Moderate	Low	Not Effective	6"	NA	6"
Acme	P	Low	Moderate	Low	Not Effective	6"	NA	1 ft
Coastal Barge Skimmer	V.M.	Moderate	Moderate	Low	Not Effective	1 ft	1-2 kts	3 ft
______ I-D	V.M.	Moderate	Moderate to High	High	High	2 ft 2-3 ft	0-2 kts 1-4 kts	3 ft 3 ft
LPI	V.M.	Moderate	High	High	Not Effective			
Skim Pak	P	Moderate	Moderate	Low	Not Effective	6"	NA	6"

[1]Effectiveness improved with preheater.
[2]For vessel mounted types only.

Table 5 -- Pump Capabilities

Pump Type	High Viscosity Oils	Small Debris (< ¼")	Moderate Debris (¼-½")	Ice (Small Pieces	Emulsification Potential	Disadvantages
Centrifugal (Monarch, Hale)	Poor	Good	Good	Good	High	Most standard types cannot handle highly viscous oils at all.
Centrifugal--Trash (Homelite, Gorman-Rupp)	Moderate to Good	Good to Excellent	Good to Excellent	Good to Excellent	High	Typically, the higher the debris handling ability of the pump the lower the high viscosity pumping and self-priming ability.
Single Diaphragm (Homelite, Gorman-Rupp)	Good to Excellent	Good*	Moderate* to Good	Good*	Low	High degree of surging from diaphragm action--not applicable for skimmers requiring even suction (Slurp).
Double Diaphragm (Wilden, Sandpiper)	Good to Excellent	Good*	Moderate* to Good	Good*	Low	Slight surging--Many diaphragm pumps are pneumatic requiring a compressor--Diaphragms are susceptible to puncture by debris.
Sliding Shoe (Megator)	Good	Good to Excellent	Good	Good	Moderate	Pump should be operated against a total head of at least 10 ft to seat shoes and maximize efficiency.
Progressive Cavity (Moyno)	Excellent	Good to Excellent**	Good to Excellent**	Good to Excellent	Low	Not designed for mobile field use, may be fixed to deck of barge.
Sliding Vane (Blackmere)	Moderate to Good	Poor	Poor	Poor	Moderate	Cannot tolerate any debris and is ill suited for cold weather.
Rotary Gear (Rotoking)	Good	Poor	Poor	Moderate	High	Can crush small pieces of ice but intolerable to most solid debris.
Hydrodynamic (Spate)	Excellent	Good	Moderate to Good	Good	Moderate	Cannot handle long pieces of debris, i.e., twigs, pencils.

*Some diaphragm pumps claim to handle debris up to 2".

**Depending on model.

Part II - Publicly Owned Oil Spill Containment and Clean-Up Equipment

Nassau County Police Department

1-42' patrol boat
3-32' patrol boats (on duty 24 hrs from April to January; one (1) boat on duty from January to April)
2-27' patrol boats (3 are generally on the North Shore; 3 are on the South Shore)

Nassau County Department of Health

1-23' Mako
2-16' Boston Whalers

Town of Oyster Bay

1-30' Columbia OBH
1-20' Boston Whaler
1-16' Boston Whaler
1-20' Garvey
1-35' Amphibious Landing Craft w/500 gal. container
1-12' Dinghy

Town of Hempstead

1 Ford Van
1 Diesel Scout 4 x 4
1 3500 lb trailer containing 1000ft of containment boom, sorbent sweeps and pads and sorbent boom, and related equipment
6 Various sized vessels for boom deployment

Material Stockpile:

500 ft M-P boom
100 boxes of sorbent pads
200' sorbent boom
400' sorbent sweeps

Town of North Hempstead

1-31' Bertram (with a 150 gpm water pump)
1-18' Boston Whaler
2-300' of Slickbar boom

Suffolk County Police Department

2-37' Egg Harbors
1-31' Chris Craft
4-30' Columbias
2-20' Shamrocks
1-22' Aquasport
1-19' Revenge
3-16' Challengers
3-16' Boston Whalers
1-15' Airgator
3-16' Grummans
1-14' Wolverine

Town of Brookhaven

1-32' Uniflite
2-20' Sealarks
1-19' Garvey
2-19' Shamrocks

Town of Babylon

1-30' Silverton (no winter service)
1-22' Airslot I/O

Town of Huntington

2-23' Patrol Boats
1-26' Work Boat
1-12' Shiff
1 4 x 4 GMC Pick-up
1 6 Wheel Drive Truck and Trailer

Material Stockpile:

300' absorbent sweeps
500 absorbent pads
50' absorbent collars

Town of Islip

In process of equipment inventory

Town of Southampton

1-36' Amphibious Lark
1-30' Dongan III
1-26' Dongan I
1-M/2 Dongan II
1-20' Pro-line (outboard)
1-17' McKee Craft (outboard)
1-16' Bayrunner
1-14' Hampton Whaler
1-14' Garvey
1-14' Grumman
1-14' Duranautic

1-24'x10' Work Barge with Hydraulic Winch

Fire Island National Seashore

Vehicles

3 4 x 4 Cherokee Jeeps
3 4 x 4 Chevy Subarbans
1 4 x 4 Dodge Rack Truck
1 4 x 4 Dodge Club Cab
1 4 x 4 Chevy Pick-Up

Boats

1-32' FINS III Inboard Diesel
1-30' FINS II Inboard Diesel
1-27' FINS IV Inboard Diesel
1-27' Boston Whaler Outrage
3-22' Boston Whalers Revenge
1-21' Stiger Outboard

U.S. Coast Guard, Marine Environmental Protection (MEP) Equipment in New York Area

*indicates equipment available for use in shallow water

Group Rockaway

	1,000 ft	Oil containment boom
*	540'	Sorbent boom (3M type)
*	6 bales	3M sorbent pads
	1 bag	Sorbent pads

Station Rockaway

*	400 ft	Sorbent boom
*	8 bales	3M sorbent pads
	1	44' boat with radar
	2	41' boats with radar
*	1	21' boat with outboard

Station Short Beach

*	400 ft	Oil containment boom (12")
*	8 bales	3M sorbent pads
	1	44' boat with radar
	1	41' boat with radar
*	1	21' boat (stored Nov.-Feb. in shed)
*	1	17' boat (stored Nov.-Feb. in shed)

Station Fire Island

*	100 ft	Sorbent boom (3M)
	6 bales	3M sorbent pads
	1	44' boat with radar (year-round)
	1	41' boat with radar (year-round)
*	1	21' boat (no winter use)
*	1	20' boat (no winter use)

Group New York

*	300 ft	Slickbar harbor boom
*	14 bales	3M sorbent pads
*	23 bales	Sorbent Sweep (100'/bale)
*	4 bags	Oil Snare sorbent
*	1	Slurp skimmer

2   41' boats with radar
5   32' boats without radar
1   30' boat
4   Response vehicles (suburban vans)
1   Command Post (16' trailer)
1   Boom trailer

U.S. Coast Guard Atlantic Strike Team (Elizabeth, NC)

Booms

5,508 ft USCG open water(high seas) boom
*1,000 ft Whittaker harbor boom
*1,000 ft Spilldam harbor boom

Skimmers

1 Lockheed 2004 disc drum skimmer (self-propelled) 1000 gpm
*1 Lockheed disc drum skimmer 50 gpm
*1 Slurp skimmer

Boats

1 22' Boston whaler (v-hull) two 85 hp
1 21' Boston whaler (Tri-hull) two 85 hp
*5 Zodiac boats 35 hp
*3 18' assault boats 25 hp

Other

5 ADAPTS type 1 Emergency Tanker Lightering Systems
1 250,000 gal Dracone barge
2 50,000 gal Dracone barge
1 10,000 gal Dracone barge

Communication Systems

USCG systems - commercial equipment may not be able to interphase easily

Long Island State Parks and Recreation Commission

2-18' Boston Whalers
1 Work Barge with Crane

New York State Department of Transportation

sorbent material stored at Hauppauge
500' Oil Containment Boom - Harbor Type
50' Light Emergency Containment Boom
160' Light Absorbent Boom
4 bales absorbent sheets
2 bales absorbent rolls

Part III - Spill Equipment Owned by Long Island Terminal Association

Carbo-Concord - Contact: Arnold Seltzer/James Grimaldi

(516) 293-2500

400' Optimax boom
12 Bundles 3M sorbent pads, booms and sweeps
1 Pump with 200' suction hose

Commander Oil Co. Inc. - Contact: Joseph G. Shapiro/Leonard Shapiro/ E.J. Barnett
(516) 922-7000
Emergency No. (516) 676-9393/(516) 922-7694

1 13' Boat on trailer/25HP motor
700' Containment boom
100-50 lbs. of absorbant
4 bales (400') Sorbent sweeps (T126)
2 1/2 bales (100') Sorbent booms (T270)
6 1/2 bales(1300') Sorbent sheets (T151)
10 bales 3M Sorbent pads

Glenhead Terminal Corp./Harbor Fuel Co., Inc. - Contact: Donald Death, Jr.

(516) 676-2500
Emergency No. (516) 676-0618

600' Slickbar boom
4 bundles Sorbent pads
1 bundle Sorbent boom
24 bags Oil Absorbent
25-50 40lb. bags Speedi-Dri absorbent

Hawkins Cove Oil Supply Co. - Contact: Bruce Hawkins

(516) 676-7200/759-0227

150' Harbor boom
4 cases Sorbent pads
4 bags Sorbent pellets
10 bags Oil Dry

Reliance Utilities - Contact: Lawrence F. Caputo

(516) 931-6800

Unspecified quantity of Speedi-Dri, Sorbent Pads and Chemical Dispersant.

Lewis - Contact: P. Miglietta

(516) 883-1000/767-2434

800' Boom
20 bags Sorbent pellets
2 bails 3M Sorbent pads
2 boxes Metro Sorbent pads
1 16' Utility Boat 15 HP

Northville Industries Corp.

Riverhead Terminal - Contact: Capt. John Dudley/Zenon Czujko

(516) 727-5600

1 Aluminum Skiff 25 HP
1 Parker Systems Skimmer Mod. 100; Ser. 88 with accessories
1 Floating Power Skimmer with associated equipment
750'x12" Floatation, Oil containment boom
300'x12" Containment boom
1200'x6' Containment boom
100'x8" Sorbent filtering boom
1 Edson Diaphragm pump

In addition the Riverhead terminal has an assortment of Sorbent materials and oil spill response support equipment such as hoses; floats and coils of polyprophylene line.

Plainview Terminal - Contact: Pete Miloski

(516) 349-8071/727-7286

1 Scavenger Pump
30 bags Speedi-Dri

Holtsville Terminal - Contact: Jeff Burns

(516) 475-5060/727-6378

1 Portable pump
60 bags Speedi-Dri

Consolidated Petroleum Terminal (Pt. Jefferson Dock) - Contact: Mr.Vandermark

(516) 941-4040
Emergency No. John Reiff/Walter Remsky (516) 941-4040

1 12' Fiberglass Skimmer Boat 2 HP
1,600' MPL Harbor Oil spill boom
3,000' 3M Sorbent sweep
20 boxes Sorbent pads
6 boxes Sorbent pillows

6 cases Type 300 Oil snare
150' Sorbent blanket
1 Edson pump
1 Lister pump with assorted hoses and equipment

Skaggs-Walsh Inc. - Contact: Peter F. Heaney

(212) 353-7000
Emergency No. Tony Sabatino (516) 389-7247
Bill Michnowitz (516) 352-2571

1 Row boat w/oars
2000 lbs. Sorbent material
55 gals Dispersant
300' Boom
1 Skimmer
200 Sorbent pads

Windsor Fuel Oil Inc. - Contact: D. Leoguande

(516) 746-5900

150' Boom
7 boxes 3M Sorbent pads
1 10' Row Boat
10 Bales Hay

Universal Utilities Inc. - Contact: Joseph Shapiro

(516) 922-7000
Emergency No. E.J. Barnett (516) 922-7694

2 bales (200') Sorbent sweeps (T126)
2 bales (80') Sorbent booms (T270)
3 1/2 bales (750') Sorbent sheets (T151)
600' Containment boom

APPENDIX C

Oily Waste Disposal

The disposal of recovered oil and of oil-contaminated materials can pose immediate and long-range problems. Recovered oil is most easily dealt with by separating out any water that may be present and refining it locally or shipping it to its original destination.

Disposal of contaminated debris is more difficult. Legal requirements for its disposal are established by the New Jersey Department of Environmental Protection for New Jersey and the New York Department of Environmental Conservation or the New York City Department of Sanitation for the New York area. In most cases, contaminated wastes should not be burned. They can be buried safely on land in approved disposal sites if correct procedures are followed. It is often advisable during waste handling, transfer, or storage to cover the area of operation with plastic sheets to prevent contamination.

Disposal can pose several problems. The first is storage and transport of oil and contaminated material to the disposal sites. Remote locations and areas sensitive to vehicular traffic impose limits on access. Helicopters or boats may be necessary to remove pillow tanks and other small storage containers. In the case of a large spill or extended containment or cleanup activities, an access road should be constructed to permit the use of heavy equipment to transport material from the recovery area to the disposal site.

The second problem involves the several available disposal methods. They include oil and water separation, burial, and natural degradation. The specific disposal method selected depends on the nature of the oil-contaminated material, the location of the spill, and the prevailing weather conditions.

Disposal of Recovered Oil

In most spill situations the oil recovered will contain a large percentage of water which should be separated out prior to disposal or recycling. In the event of a major spill, a large-scale oil/water separation operation should be set up at a local refinery, processing plant, or other facility possessing separation equipment. Many authorized waste oil and chemical processing facilities exist throughout New York and New Jersey but are oriented to chemicals and may be limited as to the quantity of material they can handle. Table 1 lists these facilities. A list of the regional liquid waste oil collectors is given in Table 2.

Disposal of Oiled Material

Oil spills can generate large quantities of oil-contaminated material consisting primarily of debris, vegetation, sediments, and sorbenst. Disposal of such debris is a major problem as only a few sites are authorized to receive oily wastes. The disposal regulations for New York and New Jersey are discussed below.

New York. In the State of New York there are presently no predesignated sites approved by the Department of Environmental Conservation (DEC) for disposal of oily wastes. In the event of a spill the DEC will consider requests for disposal on a case-by-case basis. Most landfill operations on Long Island are hesitant to accept oily wastes unless directed to do so by the DEC. There are three lined landfills on Long Island at Brookhaven, Oyster Bay and North Hempstead, which may take oily wastes. The NY DEC would like local communities to accept oily sand and debris collected from their own areas. A form letter sent by the NY DEC to local landfills would request their assistance. The form letter would describe the waste, state its volume, name the waste carrier and state there is no contamination (e.g., heavy metals, PCB's, etc.) in the oil. If contamination is suspected the

Table 1. AUTHORIZED CHEMICAL WASTE PROCESSING FACILITIES* (DISPOSAL/RECYCLING OF LIQUID WASTES)

Facility	Type of Treatment	Type of Waste Accepted
New Jersey		
Advanced Environmental Technology Corp. The Dayton Bldg. 520 Speedwell Ave. Morris Plains, NJ 07950 (210) 539-7111	Transfer, Storage	Packed laboratory chemicals, vegetable oils, motor oils, compressor oils, laboratory chemicals, solvents, pesticides, silver, platinum, gold, copper salts, acids, alkalis, dyes, pigments, solution
AntiPollution Systems, Inc. 350B W. Delilah Rd. Pleasantville, NJ 08232 (609) 641-1119	Incineration	Waste oils, emulsion, water-methanol waste, pigments, dyes
B & L Oil Corp. 472 Frelinghuysen Ave. Newark, NJ 07114 (201) 248-7925	Reprocesser	Crankcase oil, fuel oil, hydraulic oil
Browning Ferris Industries 714 Division St. Elizabeth, NJ 07207 (201) 352-2222	Transfer, Storage	Flammable solids, paint, pigment, ink sludge, oil, solvent, slurries, flammable liquids, non-flammable liquids
Clark Systems Formerly Blackwood Carbon Products Little Gloucester Rd. Blackwood, NJ (906) 589-7301	Oil Recovery	Oil and oil emulsions
Duane Marine 26 Washington St. Perth Amboy, N.J. (201) 925-6010	Oil/water separation and reprocessing. Storage facility.	Oil and oil emulsions.
Earthline Co. 100 Lister Ave. Newark, NJ 07105 (201) 465-9100	Organic reclamation, from contaminated aqueous waste, acid/base neutralization, hazardous waste detoxification (oxidation reduction), fuel reclamation	Organic, aqueous wastes, solvents, chlorinated solvents, oily wastes, acids, alkalis, cyanides, mixed heavy metal waste, waste fuel and lubricating oils

Table 1. Continued

Facility	Type of Treatment	Type of Waste Accepted
Eastcoast Pollution Control, Inc. Cenco Blvd., P.O. Box 275 Clayton, NJ 08312 (906) 881-5100	Transfer, Storage	Cleanup debris, waste oil, mixed solvents, still bottoms
Elco Solvent Corp. 30 Amor Avenue Carlstadt, NJ 07072 (601) 460-4000	Transfer, Storage	Flammable, non-flammable liquids, solvents
Inland Chemical Corp. 600 Doremus Ave. Newark, NJ (201) 589-4085	Reclamation, Recovery	Solvents, organic liquids, aqueous-organic emulsions, lacquer, paint, pigment residues
Kit Enterprises Inc. 475 Division St. Elizabeth, NJ 07201 (201) 574-8804	Reclamation, Recovery, Blending, Treatment	Oil lubricants, fats and fatty oils, heavy and light hydrocarbons
L & L Oil Service Inc. 740 Lloyd Rd. Aberdeen, NJ 07747 (201) 566-2785	Transfer, Storage, Reprocesser, Blending	Waste oil and oil sludge
Lionetti Waste Oil Service Inc. 9 Line Rd. Holmdel, NJ 07733 (201) 946-2505	Storage, Blending	Motor oils, fuel oils, hydraulic oils
Marisol Incorporated 125 Factory Lane Middlesex, NJ 08846 (201) 469-5100	Transfer, Storage, Reprocesser, Reclamation, Recovery, Blending, Treatment	Oils, emulsions, solvents, flammable organic liquids, non-flammable liquids, paint, pigment residues, flammable liquids
Modern Transportation 75 Jacobus Ave. Kearny, NJ 07032 (201) 589-0277	Transfer, Storage, Reclamation, Recovery, Treatment, Disposal	Oils, emulsions, acid, alkali solutions, wastewaters, acids alkalis

Table 1. Continued

Facility	Type of Treatment	Type of Waste Accepted
Oil Recovery Co. Inc Cenco Blvd. P.O. Box 345 Clayton, NJ 08312 (609) 881-7400	Storage, Reprocesser, Reclamation, Recovery, Blending	Waste oil, solvents, oil sludge
Rollins Environmental Services P.O. Box 221 Bridgeport, NJ 08014 (609) 467-3100	Incineration, Neutralization, Chemical Treatment, Recovery, Reclamation, Transfer, Storage	Sludges, contaminated residues, spill debris, process wastewater, slurries, tank cleanings, solvents
S & W Waste, Inc. 25 Delmar Rd. Jersey City, NJ (201) 344-4004	Transfer, Storage	Paint, dyes, pigment residues, heavy metal residues, flammable solids, oils, emulsions, flammable liquids, acids, alkalis, solvents
Safety-Kleen Corp. Almo Industrial Park Clayton, NJ 08312 (609) 881-2526	Reclamation, Recovery	Oil, oil emulsions, oil sludges, mixed solvents
Standard Tank Cleaning Co. 184 Hobart Avenue Bayonne, NJ 07002 (201) 339-5222	Recovery, Storage	Oils, emulsions, organic sludges, non-flammable liquids, flammable liquids
New York		
Chemical Waste Disposal Corp. 42-19 19th Ave. Astoria, NY (212) 274-3339	Processing/Treatment Recycling/Reclamation Distillation for oil recovery	Sludges, paint, oil, lab chemicals, plating waste, chlorinated solvents
Frontier Chemical Waste Process, Inc. 4626 Royal Avenue Niagara Falls, NY 14303 (716) 285-8200	Processing/Treatment Recycling/Reclamation	Waste oil/industrial waste, reusable chemicals, nonchlorinated oil, burnable liquid wastes, recovered methanol, recovered oil, chlorinated solvents
Haz-O-Waste Corp. Canal Road Wampsville, NY (315) 682-2160	Processing/Treatment Recycling/Reclamation Distillation	Solvents, waste oil, burnable, liquid wastes, acids, alkalis, sludges

Table 1. Concluded

Facility	Type of Treatment	Type of Waste Accepted
NEWCO Chemical Waste Systems, Inc. 4626 Royal Ave. Niagara Falls, NY 14303 (716) 278-1811	Processing/Treatment Recycling/Reclamation	Hazardous/toxic wastes and most every other waste stream except radioactive and shock-sensitive explosives
SCA Chemical Waste Services, Inc. 1550 Balmer Rd. Model City, NY 14107 (716) 754-8231	Processing/Treatment Recycling/Reclamation Secure landfill	Solvents, acid, heavy metal sludge, paint wastes, PCB solids and sludges, contaminated soil, organic liquids

Sources: New Jersey Department of Environmental Protection and New York Department of Environmental Conservation

*Check authorization status with the New York D.E.C. (212) 488-3862 or the New Jersey D.E.P. (609) 292-5560 prior to use.

Table 2. APPROVED WASTE OIL COLLECTORS (LIQUID HAULING)

Name and Address of Firm	No. of Trucks
New York	
Ace Waste Oil, 71-34 58th Avenue, Maspeth, NY 11378	
Akba Waste Oil, 3836 Hahn Ave., Bethpage, NY 11714	
A-Z Waste Service, Inc. 60 Harmon St., Falconer, NY 14733	9
Albany Waste Oil Corp., RD #2, Clifton Park, NY 12065	2
Alboro Construction Co., 90-48 Corona Ave., Elmhurst NY 13209	1
Allied Chemical Corp., P.O. Box 6, Milton Ave., Solvay, NY 13209	6
Allied Waste Corp., 88-13 204 St., Hollis, NY 11423	3
American Chemical Disposal Corp., Oser Ave., Hauppauge, NY 11778	
Buckner Waste Oil Service, 21 Stonecrest Dr., New Windsor, NY 12550	1
Certified Waste Oil, 320 Court House Rd., Franklin Square, NY 11010	
C & F Pollution Control, Inc., 3266 Taylor St., Schenectady, NY 12306	4
Chamberlain's Septic Service, 1835 Route 104, Union Hill, NY 14563	6
Chemical Management, Inc., 340 Eastern Parkway, Farmingdale, NY 11735	
Chemical Waste Disposal Corp., 42-14 19th Avenue, Astoria, NY 11105	2
C.H. Heist Corp., 505 Fillmore St., Tonawanda, NY 14150	5
Coastal Pollution Control Services, Inc., P.O. Box 140, Renesselaer, NY 12144	4
Cortlandt's Septic Tank Service, Inc., P.O. Box 351, 22 Albany Post Rd., Mentrose, NY 10548	6

Table 2. Continued

Name and Address of Firm	No. of Trucks
County Tank Lines, Inc., Rte. 58 - E. Main Street, Riverhead, NY 11901	
County Waste Oil, Inc., 57 Brown Place, Harrison, NY 10528	3
Domermuth Petroleum Equipment and Maintenance Corp., Box 62, Clarksville, NY 12041	6
Duane Marine Corp., P.O. Box 435, Staten Island, NY 10308	
East Coast Tank Lining Corp., 700 Hicks St., Brooklyn NY 11231	3
Elmwood Tank Cleaning Corp., 62 West Market St., Buffalo, NY 14204	5
Environmental Oil, Inc., P.O. Box 315, Syracuse, NY 13209	5
E.W. Wllsworth and Sons Sanitation Service, 219 Mitchell Ave., Mattydale, NY 13211	2
Fourth Coast Pollution Control, La Grasse St., Waddington, NY 13694	3
Frank Masone, Inc., 368 Ocean Ave., Lynbrook, NY 11563	4
Frank's Bay City Oil Service, 1117 Olympia Rd., No. Bellmore, NY 11710	
Frontier Chemical Waste, 4626 Royal Avenue, Niagra Falls, NY 14303	3
General Electric Co., P.O. Box 8, Room 2C13 K-1, Schenectady, NY 12301	1
General Waste Oil Co., 37 Longworth Ave., Dix Hills NY 11746	
Harrison Radiator Div. GMC, Upper Mountain Rd., Lockport, NY 14094	3
Industrial Oil Tank and Line Cleaning Service Co., 307 East Garden St., Rome, NY 13440	4
Inland Pollution Control Inc., P.O. Box 357, 63 Columbia St., Rensselaer, NY 12144	2

Table 2. Continued

Name and Address of Firm	No. of Trucks
J.B. Waste Oil Co., 18-18 41st St., Long Island City, NY 11105	
James Parks, 2734 Chestnut St., York, NY 14592	1
Janic Waste Oil Corp., Bay Street, Freeport, NY 11520	
J.K. Waste Oil Service, 280 Grank Blvd., Deer Park, NY 11729	2
J.W. Lenza Oil Company, 3 Court St., Staten Island, NY 10304	1
Kroll Associates, 19 Woodgate Rd., Tonawanda, NY 14150	RENTAL
Loeffel's Oil Service, RD #2, Narrowburg, NY 12764	3
Lomasney Combustion, Inc., 366 Mill St., Poughkeepsie, NY 12602	2
Long's Landscaping, 2106 Love Rd., Grand Island, NY 14072	1
Luzon Oil Company, P.O. Box 19, Hurleyville, NY 12747	2
Manhattan Oil Service, 21-11A 46th St., Astoria, NY 11105	1
Marine Pollution Control, Inc., 460 Terryville Rd., Port Jefferson Station, NY 11776	4
New Era Oil Service, Inc., 402 Parsons Drive, Syracuse, NY 13219	5
Niagra Mohawk Power Corp., 300 Erie Blvd., West Syracuse, NY 13202	2
Niagra Tank and Pump Co., 262 Carlton St., Buffalo, NY 14204	1
Oceanside Equipment Rental Corp., 70 New St., Oceanside, NY 11572	3
Oldover Corp., P.O. Box 2, Saugertiers, NY 12477	1
Patterson Chemical Co. Inc., 102 Third St., Brooklyn, NY 11231	
RGM Liquid Waste Removal, 972 Nicols Rd., Deer Park, NY 11729	

Table 2. Continued

Name and Address of Firm	No. of Trucks
Rice Tank Cleaning Corp., 434 Suffolk Ave., Box 296, Central Islip, NY 11722	7
Wm. F. Sheridan, Jr. Industrial Oil Corp., 114 Peconic Ave., Medford, NY 11763	
Southgate Oil Services, Inc., P.O. Box A, 2699 Transit Rd., Elma, NY 14059	9
Stage Construction Co., Inc., 105 Commercial Ave., Vestal, NY 13850	2
Strebel's Laundry, 644 Montauk Highway, Westhampton, NY	
Superior Pipecleaning, Inc., 168 Woodlawn Ave., Woodlawn, NY 14219	5
Swanson Chemical Laboratories, Inc., 4 West First St., Lakewood, NY 14750	1
Timber Lake Campground, Plato Maples Rd., RFD #1, Box 72, E St., Otto, NY 14729	1
United Pump and Tank of Rochester, Inc., 779 Arnett Blvd., Rochester, NY 14619	1
Verdi Construction, Route 31, Savannah, NY 13146	6
Wizard Method, Inc., 1100 Connecting Rd., Niagra Falls, NY 14304	14
W.L. Oil Co., Inc., 178 North Elting Corners Rd., Highland, NY 12528	2
W.M. Spiegel Sons, Inc., 461 E. Clinton St., Elmira, NY 14902	7
World Wide Pollution Control, Inc., P.O. Box 702 New Station, New Paltz, NY 12561	3
New Jersey	
A.M. Environmental Services, Inc., 1031 Market St., Paterson, NJ 07513	7
Angus Tank Cleaning Corp., One Ingham Ave., Bayonne, NJ 07002	6

Table 2. Continued

Name and Address of Firm	No. of Trucks
Clean Venture, Inc., P.O. Box 418, Foot of South Wood Ave., Linden, NJ 07036	1
Depalma Oil Co., 21 Myrtle Ave., Jersey City, NJ 07305	4
Eastcoast Pollution Control, Inc., Cenco Blvd., Clayton, NY 08312	12
Energall, Inc., 411 Wilson Ave., Newark, NJ 07105	18
Essential Trucking Corp., Fanny Rd., Boonton, NJ 07005	3
Kisko Transportation Co., Inc., 504 Raritan St., Sayerville, NJ 08872	1
Loeffel's Waste Oil Service, Inc., P.O. Box 651, Old Bridge, NJ 08857	3
Marisol, Inc., 125 Factory Lane, Middlesex, NJ 08846	4
Nalco Chemical Co., 1927 Nolte Drive, Paulsboro, NJ 08066	1
Ned's Waste Oil Service, P.O. Box 375, Newton, NJ 07860	4
Phil's Waste Oil, 13 Ronald Drive, E. Hanover, NJ 07936	1
Robert More Waste Oil, 124 Baltimore St., North Arlington, NJ 07032	1
SCA Chemical Services, Earthline Division, 100 Lister Ave., Newark, NJ 07105	47
Solvents Recovery Service of New Jersey, Inc., 1200 Sylvan St., Linden, NJ 07036	2
T/A Samson Tank Cleaning, 101 E. 21st St., Bayonne, NJ 07002	3
<u>Other</u>	
Acme Services, Inc., 985 Plainfield St., Johnston, RI 02919	7
Berks Associates, Inc., P.O. Box 305, Douglassville, PA 19518	4

Table 2. Concluded

Name and Address of Firm	No. of Trucks
Colvin's Waste Oil Service, 24 Marrer St., Warren, PA 16365	1
G & H Oil Co., 455 Hemlock Rd., Warren, PA 16365	1
Hitchcock Industrial Liquid Waste, 40 California St., Bridgeport, CT 06608	5
Jet Line Services, Inc., 441R Canton St., Stoughton, MA 02072	18
New England Marine Contractors, Inc., 189 Lakeside Ave., Burlington, VT 05401	6
New England Pollution Control Co., Inc., 7 Edgewater Pl, E. Norfolk, CT 06855	6
Schofield Oil Ltd., P.O. Box 40, Breslau, Ontario, Canada NOB 1MO	3
Solvents Recovery Service of New England, Inc., Lazy Lane, Southington, CT 06489	6
The Crago Co., Inc., Route 26, P.O. Box 409, Gray, ME 04039	3
Tansenvironmental Corp., 500 Ford Blvd., Hamilton, OH 45011	1
Tricil Limited, 602 Rte. 132, Ste. Catherine, Quebec, Canada	1

NY DEC would analyze the contents. This plan is still in the fromative stages.

New York City. All requests for information relative to disposal of oil-contaminated solid wastes shall be channeled through the NYC Department of Sanitation, Operations Control Office, Bureau of Waste Disposal at the following numbers:

(212) 566-5326/5327

The following locations have been designated for receipt of oil-contaminated solid waste generated during and as a result of oil spill cleanup operations. Use of the following disposal facilities will be limited to those carriers possessing a "NYS DEC Industrial Waste Collector Certificat of Registration" (SW-3) and either a Department of Consumer Affairs Waste Conveyance License or a Department of Sanitation Construction Waste Permit. Disposal of materials will be from 0800 to 1600, Sundays and holidays excluded.

NYC Disposal Sites - Fountain Avenue Landfill
Fountain Ave. & Belt Parkway
Brooklyn, N.Y.

Edgemere Landfill
Beach 49th St. & Beach Channel Dr.
Rockaway, Queens, N.Y.

Brookfield Avenue Landfill
Arthur Kill Rd. & Brookfield Ave.
Staten Island, N.Y.

A list of qualified and approved regional oily solid waste carriers is given in Table 3.

If further information be required, Mr. Gus Fischetti, Engineer in Charge of Landfills, should be contacted, (212) 272-9811.

New Jersey. For disposal of oil-contaminated solid wastes within the State of New Jersey, contact the New Jersey Department of Environmental Protection for an approved dump site at (609) 292-5560. There are currently no

Table 3. APPROVED OILY WASTE CARRIERS (SOLID WASTE BUILDING)

Active Oil Service, Inc. 374 Main Street Belleville, NJ 07109 (201) 482-4600	National Oil Recovery Corp. Hook Road & Commerce Street Bayonne, NJ 07002 (201) 437-7300
Atlantic B.C., Inc. 145 Van Dyke Street Brooklyn, NY 11231 (212) 522-3260	Newtown Refinery Corp. 37-80 Review Avenue Long Island City, NY 11101 (212) 729-7660
Chemical Control Corp. 23 South Front Street Elizabeth, NJ 07202 (201) 351-5460	Oceanside Equipment Rental Corp. 70 New Street Oceanside, NY 11572 (516) 678-4466
Earth Line, Inc. End of Wood Avenue Linden, NJ 07036 (201) 862-4747	Oil Tank Cleaning Corp. 107-127 27th Street Brooklyn, NY 11232 (212) 499-9608
East Coast Tank Lining Co. 700 Hicks Street Brooklyn, NY 11231 (212) 855-7272	Petroleum Tank Cleaners, Inc. 145 Huntington Street Brooklyn, NY 11231 (212) 624-4842
Guardino & Sons, Inc. 80 Broad Street New York, NY 10004 (212) 943-6966	Royal Tank Cleaning Corp. 687 S. Columbia Avenue Mount Vernon, NY 10550 (914) 664-7070
Mobil Oil Corp. 4165 Arthur Kill Road Staten Island, NY 10307 (212) 948-5400	Samson Tank Cleaning Corp. 101 East 21st Street Bayonne, NJ 07002 (201) 437-1044
Modern Transportation Co. 75 Jacobus Avenue S. Kearney, NJ 07032 (201) 589-0277	Standard Tank Cleaning Corp. One Ingham Avenue Bayonne, NY 07002 (201) 339-5222

approved dump sites in New Jersey. Approval for dumping oil-contaminated solid wastes is granted on a case-by-case basis.

All vehicles used in the collection or haulage of solid waste shall properly and conspicuously display the New Jersey Solid Waste Administration (NJSWA) registration number in letters and numbers at least 3 inches in height, and shall carry the current Solid Waste Administration registration certificate in the vehicle. In addition, in letters and numbers at least 3 inches in height, the capacity of the vehicle in cubic yards or in gallons, with the appropriate unit designated, shall be marked on both sides of the vehicle so as to be visible to the operator of the solid waste facility.

Further, all vehicles containing oil-contaminated waste shall be conspicuously placarded by the special waste hauler. Such placarding shall meet the requirements of the United States Department of Transportation for the transport of hazardous materials (49 CFR 170 et seq.).

No special waste facility shall accept oil-contaminated waste unless the vehicle is properly placarded in accordance with this section.

Temporary Waste Storage. If there are large quantities of materials for disposal, a temporary storage site should be established. A temporary storage site provides a location to store oily sediment and debris removed during shoreline cleanup operations until a final disposal site has been located, approved, and made operable. The temporary storage sites should be located in areas with good access to the shoreline cleanup operation and to nearby streets and highways. Good storage site locations are flat areas such as parking lots (paved or unpaved) or undeveloped lots adjacent to the shoreline.

Temporary storage sites should be selected and prepared to minimize contamination of surrounding areas from leaching oil. Therefore, storage sites should not be located on or adjacent to ravines, gullies, streams, or the sides of hills, but on flat areas with a minimum of slope. Once a location is selected, certain site preparations are usually necessary to contain any leaching oil. An earth berm should be constructed around the perimeter of the storage site. If a paved parking lot is used, earth would have to be imported from nearby areas; if an unpaved surface is used, material can be excavated from the site itself and pushed to the perimeter thereby forming a small basin. Entrance and exit ramps should be constructed over the berm to allow cleanup equipment access to the site. If the substrate or berm material is permeable, plastic liners should be spread over the berms and across the floor of the storage site in order to contain any possible oil leachate.

A front-end loader should be stationed at each storage site to evenly distribute the dumped oily material and to load trucks removing the material to final disposal.

APPENDIX D

Dispersants

Introduction

Spills of crude oil and petroleum products in the marine environment can result in varying types and degrees of environmental damage. In some cases spills may even involve threat of fire and explosion. To reduce these threats, various specialized techniques and equipment have been developed and used with different degrees of success. In almost all cases, limitation of spread and physical recovery of the spilled material represent the most environmentally acceptable actions and should always be given first consideration. However, as a result of spill size, weather, and other factors, control and recovery are not always adequate or even possible. Other options to minimize impacts should be explored in these situations.

An alternative to conventional methods of containment and recovery is the use of chemical dispersants. Dependant on the oil characteristics dispersants can assist the breakup and mixing of oil slicks into the water column, accelerating dilution and degradation rates. In addition, they may be used in sea states where conventional techniques are no longer effective.

Federal Regulation

The use of chemical dispersants is closely regulated by the federal government and can only be initiated in situations where it is deemed the most effective and least environmentally hazardous alternative. While advocating physical control and removal of spilled oil, the National Oil and

Hazardous Substances Pollution Contingency Plan provides the basis for case-by-case utilization of chemical dispersants and other treating agents. Known as Annex X, this schedule permits consideration of chemical dispersion in the following circumstances (40 CFR 1510, Annex X, Sections 2003.1-1 to 2003.1-1.3):

- In any case when, in the judgement of the federal On-Scene Coordinator (OSC), their use will prevent or substantially reduce hazard to human life or limb or substantially reduce explosion or fire hazard to property.
- For major or medium discharges when, in the judgement of the on-scene Environmental Protection Agency representative, their use will prevent or reduce substantial hazard to a major segment of the population(s) of vulnerable species of waterfowl.
- For major and medium discharges when, in the judgement of the Environmental Protection Agency response team member in consultation with appropriate state and federal agencies, their use will result in the least overall environmental damage, or interference with designated water uses.

Principals of Dispersion

Dispersion may be defined as the act or state of being broken apart and scattered. Oil floating on water will ultimately disperse naturally in response to currents and waves. As the degree of surface energy increases, the rate of natural dispersion increases. Typically, however, the natural process is slow and agitation of some oils often results in the formation of extremely persistent and difficult to treat water-in-oil emulsions (tar balls, mousse). For some oil types dispersants can greatly increase the rate of dispersion and prevent the formation of water-in-oil emulsions reducing the potential damage associated with floating slicks.

Dispersant formulations contain varying amounts of surface active agents (or surfactants). Technically, surfactants act to modify (reduce) the oil surface tension. Each surfactant molecule may be thought of as polar in nature, one end having an affinity for oil, and the other an affinity for water. When applied to floating oil, the surfactant diffuses through the oil and individual surfactant molecules orientate themselves along the surface with their water attracting ends out. (It is critical that the dispersant contact the oil and not be applied to the surrounding water.) As the slick is broken apart by natural or manmade energy, treated particles are separated and repelled, preventing slick reformation. Eventually, treated oil particles are broken into small enough drops that they remain suspended and dispersed in the water. Because the oil particles are surrounded by surfactant molecules, they tend not to adhere to solid objects such as boats, shorelines, etc. In dispersed form, the spilled oil has a much larger surface area which serves to accelerate solution, evaporation, photo-oxidation, and biodegradation rates.

Environmental Effects

The acceptance of chemical dispersants as a means of combatting oil spills has been deterred by real and inferred environmental damages associated with a few misapplications of early high toxicity products and a limited knowledge of the potential effects of the modern, low toxicity dispersant formulations.

However, there has been little evidence from actual field use of dispersants to prove or disprove significant effects resulting from the proper application of chemical agents. In contrast, the ecologic realities associated with spilled oil - particularly in coastal and shoreline areas - are dramatic and far better understood. When predictable damage or threats associated with untreated oil are compared with the known and unknown aspects of chemically treated oil, it may be possible to identify cases in which one action has significantly less total risk than another.

Toxicity data on government accepted dispersants are available from the EPA in the form of LC_{50}'s. Using the effective dosage rates, the potential concentrations of dispersants in the water column can be estimated and compared to their LC_{50} values. The comparison can then be used to predict possible ecologic consequences.

Some laboratory and field evidence suggests that chemically produced oil dispersions may be more toxic than naturally produced dispersions. It has been hypothesized that this phenomenon is a synergism between oil and dispersant which produces more toxic end products. Certain toxic components in the oil are activated, and therefore, preferential release of other toxic components occurs. A dispersant can increase the rate at which volatile fractions of oil are available to enter the water column. It is generally believed, however, that the "increased toxicity" of a dispersion is more related to the increased availability of the oil to various marine organisms. By breaking the oil up into minute droplets, the dispersant enhances the uptake and incorporation of certain oil components by many marine organisms through their breathing and feeding mechanisms. For this reason, dispersed oil at a given concentration may have a more adverse impact on a biological amenity than untreated oil at the same concentration.

Undispersed oil in nearshore areas and on shorelines can smother organisms and plants and cause extensive physical and aesthetic impacts. Undispersed oil is difficult and expensive to clean up because it typically adheres to shoreline surfaces.

Use

There are three basic types of modern dispersants: water-base, solvent-base, and concentrate. They differ mainly in the nature of their carrier

Table B-1. DISPERSANT APPLICATION EQUIPMENT AND TECHNIQUES

Type of Equipment	Application Technique	Dispersant Type
Hand-operated garden sprayer	Manual application from vessel or dock	Premixed solvent base, water base or concentrate
Portable pump and hand-carried spray nozzle	Manual application from vessel or dock	Premixed solvent base or concentrate
Spray boom and low pressure pump	Direct application from vessel at sea; agitation with breaker boards	Premixed solvent base
Spray boom, high pressure pump and eductor or metering pump	Direct application from vessel at sea: agitation with breaker boards, water streams or propwash optional	Concentrate or water base diluted onboard with sea water
Fire monitor/hose, high pressure pump, and eductor or metering pump	Direct application from vessel at sea or from dock: agitation optional	Concentrate or water base dilluted onboard or dockside with sea water
Helicopter with spray booms	Aerial application: agitation from wind and waves	Undiluted concentrates
Light aircraft with crop dusting apparatus	Aerial application: agitation from wind and waves	Undiluted concentrates
Heavy aircraft with spray booms	Aerial application: agitation from wind and waves	Undiluted concentrates

medium and the ease with which dispersions are formed. Dispersion using water-base formulations typically requires more time and energy. Because they use water as a solvent, these products can be diluted on-site with seawater, thus lending themselves to vessel application. Solvent-base formulations tend to disperse more easily, but are generally more toxic and require higher dosage rates. They are ineffectual when diluted with water. Concentrates contain high percentages of surface active agents. Depending on the product, they may be used neat, diluted with seawater, and/or diluted with hydrocarbon solvents. The "self-mixing" type of concentrate requires extremely low levels of mixing energy. By virtue of their versatility, dispersant concentrates lend themselves to most methods of application.

Dispersant use is greatly affected by the type of oil. Rapidly spreading oils are more easily dispersed than heavy or slowly spreading oils. Solvent base dispersants were formulated primarily for use on heavy or paraffinic oils as they are harder to break down. Chemical dispersion of highly weathered oils or water-in-oil emulsions is typically very difficult, if not impossible.

Application Techniques and Equipment

There are three basic techniques used to apply dispersants to floating oil; each has its own variety of application equipment. The three application techniques are: manual, vessel and aerial. The actual equipment and technique used depends on the type of dispersant to be applied, and the size and location of the spill. Table B-1 lists the type of equipment needed for the various dispersing agents and application techniques.

Manual Application. Manual application is typically limited to use in very small spills or confined areas. The equipment consists of three-to-five-gallon garden sprayers, usually the backpack type, or portable pumps with hand-carried nozzle sprayers. Equipment should be fitted with nozzles producing a coarse spray for applying dispersants. Manual application is usually done from the shoreline, a dock or pier, and can also be done from small boats.

Vessel Application. Basically, there are three types of vessel mounted application systems: bow spray, Warren Spring Laboratory (WSL) - type, and high-pressure jet spray. The bow spray and WSL systems both use booms fitted with spray nozzles to apply the dispersants. The nozzles produce coarse flat sprays which overlap slightly at the water surface. The bow spray system has the booms mounted near the vessel bow. With the WSL system, booms are positioned slightly aft of midship. The WSL system also incorporates breaker boards towed behind the spray booms to provide external mixing energy. Bow wakes and propellor wash from several small boats and high-pressure water streams from fire fighting equipment can also be used to supply energy.

The third system uses fire fighting monitors or hand-held nozzles to apply dispersants. The high-pressure streams are directed in an arc up over the slick or played back and forth across the oil. In most cases the vessel's own salt-water fire fighting system is used.

These systems are used primarily to apply water-base or concentrated dispersants in heavily diluted solutions. The systems operate by drawing water from the sea and supplying it to the booms or monitors at high pressures and volumes (100 psi and 100-250 gpm respectively). The dispersant is introduced into the mainstream of water using an eductor or metering pump at a rate which produces the desired concentration.

Also available is a WSL low pressure volume system for applying hydrocarbon-base dispersants. In this case the agent is supplied directly to the booms with no dilution.

Aerial Application. Three types of aircraft have been used in aerial application of dispersants: helicopters, light, and heavy fixed-wing aircraft. Suitable aircraft typically come fitted with agricultural or fire fighting spray systems which require only minor modification for dispersant use. The spray systems are usually supplied with misting or atomizing nozzles which must be replaced with ones producing a coarse spray.

Two types of spray systems are available for use with helicopters. One is the on-board type which has the spray booms, tanks, and motor fitted directly to the helicopter. The other system has a single unit consisting of the booms, tank and pump, which is slung underneath the helicopter. The advantage of this system is that it can be hooked up in a matter of minutes to almost any available helicopter.

Dosage

Dosage required for effective dispersion will vary with each spill situation. Most manufacturers supply or can provide dosage recommendations with their products. Subject to regulatory approval, these recommendations can be used as a starting point for dosage determination. The optimum dosage (number of gallons of dispersant applied per acre of slick), is primarily governed by the slick thickness. Generally, the amount of dispersant required is directly proportional to the thickness, and therefore the volume of oil per acre. Under normal conditions the recommended dosage for most dispersants is 5 to 10 gallons per acre for an average slick thickness of 0.5 to 2.0 mm. By trial application, dosage should be adjusted to achieve the desired result at the minimum application rate.

APPENDIX E

Filter Fence/Sorbent Barrier

Permeable barriers constructed onsite and made of wire screen or mesh and sorbents can be used to contain or exclude oil from interior areas such as marsh, channels and mosquito ditches. Permeable barriers offer the advantages of noninterference with flow, conformance with bottom configuration, and response to tidal variation. Because of flow reverses in tidal areas, double barriers are required. A diagram of a typical permeable barrier is shown in Figure A-1. While a variety of screen and mesh fencing is available, heavier materials are recommended. When subjected to high currents and debris, lighter material such as chicken wire will probably fail.

Single-sided permeable barriers may be constructed in small streams or channels having continual water flow in one direction. In this case a single line of posts is driven into the stream bottom with the screen fastened to the upstream side. Sorbent is also placed on the upstream side of the barrier only, relying on the current to hold it in place.

The screen height in both cases must be sufficient to prevent sorbent from going over the top at high tide and under the bottom at low tide. The screen mesh size must be compatible with the type and size of the sorbent used.

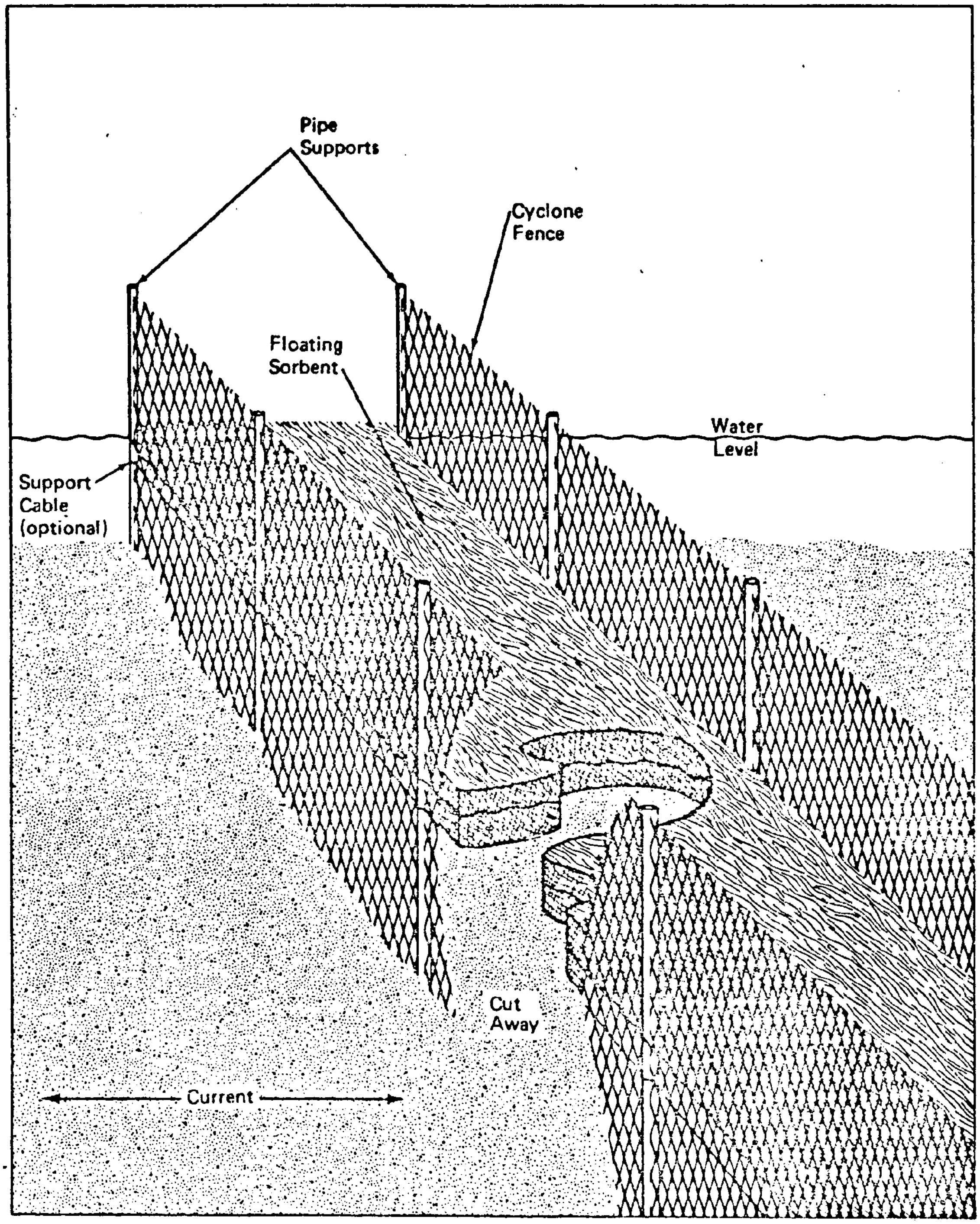


Figure 1. TYPICAL PERMEABLE BARRIER